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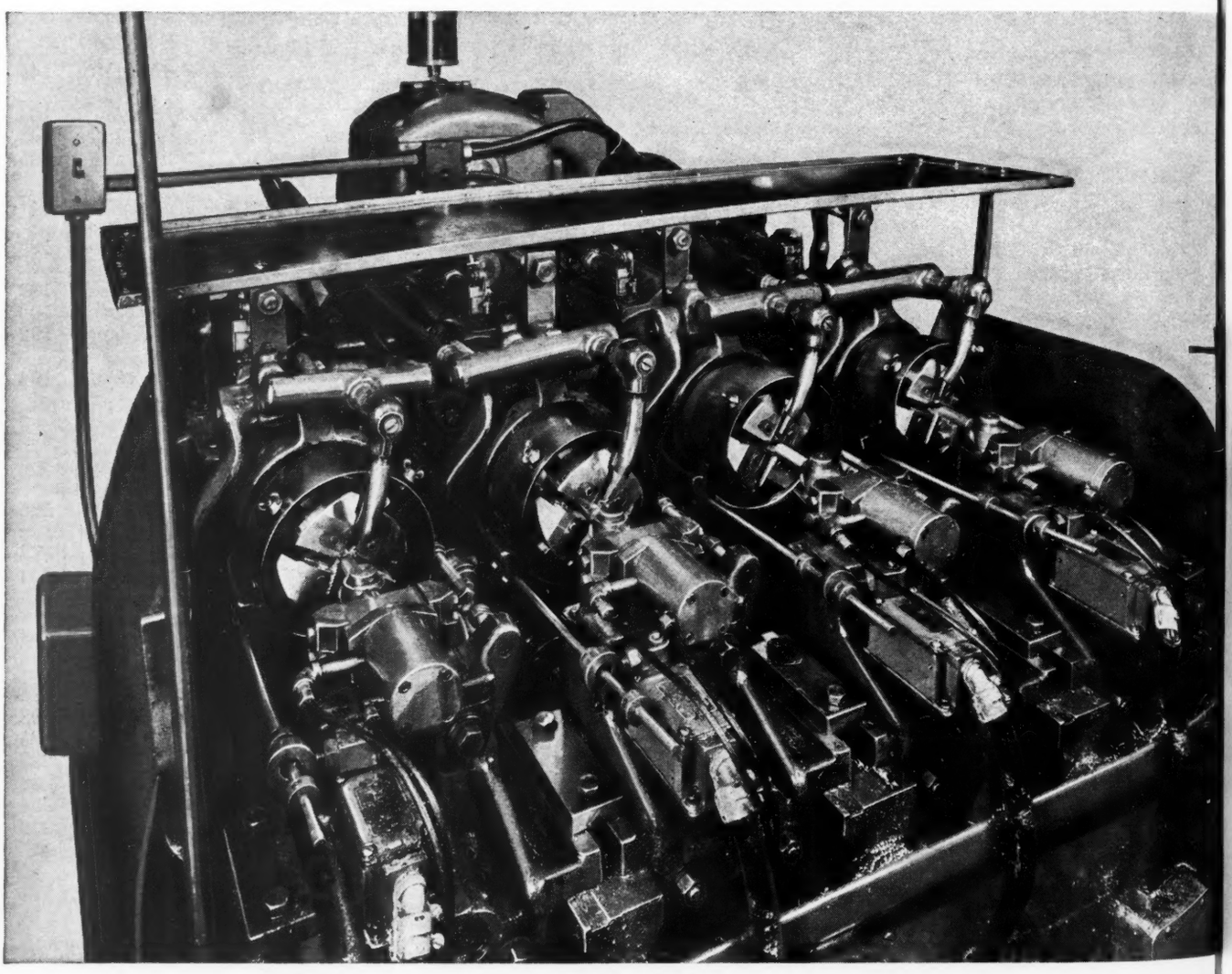
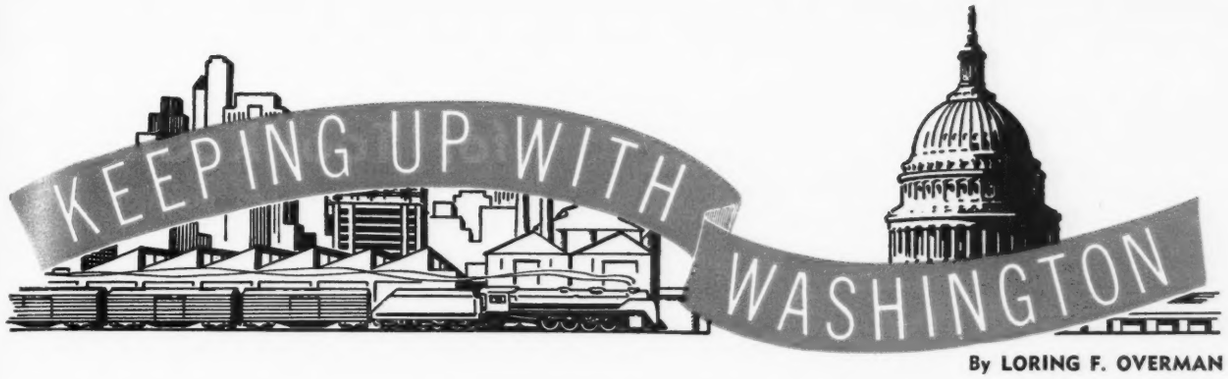
LABOR COST . . . *with* LANDIS *Semi-*

Illustrated in the plant of a large manufacturer of automobile parts is a LANDIS 4 Spindle Semi-Automatic Machine mass-producing 7/16" 18-P threads 2¼" in length on tie rod sockets. The threads are cut to a Class 3 fit at the rate of 520 pieces per hour. This operation was formerly performed on a double-spindle machine . . . at twice the cost in labor.

This machine, whose diametrical capacity ranges from ¼" to 1", is designed for the mass-production of precision threads. During the operation illustrated here, manual labor consists merely of placing the blanks on work-holding pins and removing them when threaded. The machine is so compactly built that one operator can easily reach any one of the four work-loading stations from a fixed central position—a feature which enables one man to do the work of two with minimum operating fatigue.

Through the combined output of four die heads, high production is obtained at comparatively low spindle speeds. This feature not only results in finer thread finish, but also greatly extends chaser life, thus effecting a sharp reduction in tool cost. Other advantages inherent in the LANDIS 4 Spindle Semi-Automatic Machine include: quick set-up; thread concentricity; elimination of side-shave; and adaptability to a wide range of threading operations. For complete information, write for Bulletin E-88.





By LORING F. OVERMAN

NPA Wrestles with Material Shortages

THE rather prevalent idea that the United States has inexhaustible supplies of everything it needs to run both a civilian economy and a defense program concurrently at top speed is being shattered in Washington these days. One by one, industry advisory committees and other opinion-molding groups are being called to the capital and given a closed-door view of the facts of life.

AS matters stand today, Industry is in the position of carrying a joint "Civilian-Defense" bank account. Assuming that it has a certain balance in the bank, Industry has proceeded "as usual" with its civilian program—forgetting that the first check presented for payment claims the funds.

When the Production and Requirements Committee of NPA added up the checks that government claimant agencies representing industry and defense programs planned to cash during the first quarter of 1952, it was evident that all were "overdrawn." Stated requirements for carbon steel were 156 per cent of the expected supply during the first quarter. Requests for structural shapes—classified as the core of the defense plant expansion program — totalled 205 per cent of available supply. Other claims were as follows: Plates and critical carbon steel items, 108 per cent of supply; alloy steel, 160 per cent; stainless steel, 170 per cent. Aluminum claims were 177 per cent of expected supply, and in the copper industry, the brass products figure was 175 per cent; the wire mill 166 per cent, the foundry 160 per cent.

The major job of the NPA Production and Requirements Committee will now be to achieve a balance between supply and requirements. "This means," NPA says ominously and obviously, "that there will be further reductions in all programs during the first quarter of next year." Where these cuts are to be made, and how much deeper the incisions can be without killing the business goose is the question that has Washington puzzled. Defense Mobilizer Wilson, whose loyalty to business must be tempered by his knowledge of the seriousness of the defense requirements, has indicated he wants civilian production kept above the "break even" point from the profit standpoint. But already, auto production is cut to 60 per cent of 1950, and most other consumer durables are working on a 58 per cent of 1950 basis.

Obvious solution—for the customers of the machinery industry, and for the machinery industry itself—is to supplement civilian production with defense contracts. For the builders of machinery and machine tools, this should not prove too difficult. The defense program continues to mushroom, and its appetite for machines and the products of machines appears insatiable.

LATEST candidate for inclusion in the Controlled Materials Plan is lead. CMP now considers steel, copper, and aluminum as the only three metals requiring such complete programming. But the Plain Bearing Industry Advisory Committee thinks otherwise. Its members produce copper bushings, sleeve bearings, and steel-backed bearings lined with various compositions containing lead, copper, or tin.

Committee members, meeting recently in Washington with NPA officials, said that unless more assistance is received, a critical shortage of plain bearings may develop. Steel or copper is useless to the industry, members explained, unless they have matching supplies of lead. Any interruption in the production of such bearings would curtail production of all types of Diesel and internal combustion engines used for trucks, farm equipment, combat vehicles, and passenger cars.

NPA officials termed the outlook "bleak." They reported that 30,000 tons of copper were lost in the recent work stoppage, and total lead imports in 1951 will be only slightly more than half as much as last year. Lead scrap exports are soon to be stopped, it was indicated.

ANOTHER critically grave situation involves the supply of iron and steel scrap. They're now calling it, in Washington, the "Achilles' heel" of the defense program. As put by C. E. Huntley of the American Short Lines Railroad Association, "If we don't have scrap, we won't have steel." A Trade Association Information Committee has been formed to spur scrap drives at industry levels. Door-to-door collections are not yet a part of the picture; industry needs a lot of heavy scrap—fast.

ON the cheerier side, the $60,000,000 expansion program of the antifriction bearing manufacturing industry has been reported reasonably on schedule, despite delays in obtaining some needed machine tools and uncertainties as to types and sizes of bearings that will be most needed. NPA has indicated that the full output of the expanded industry will be required, with the demand for instrument type bearings especially large.

NEWEST addition to the growing list of scarcities—a contributing factor to possible shortages of steel and aluminum—is power. The problem originates with hydro-electric power shortages in the Pacific Northwest, present site of aluminum facilities. The proposed solution—moving the aluminum facilities to mid-West areas and expanding fuel-power production—stumbles over its own feet. More than a year would be required, it is estimated, to complete fuel-power plants. More important, however, there isn't enough steel for plant expansions already planned without adding a huge power facilities program.

AGAIN, as in World War II, superimposing a defense program upon a civilian economy opens a Pandora's chest of unexpected difficulties.

Titanium—A Metal with Future Possibilities

TITANIUM has become almost a magic word to some branches of industry because of the possibilities which this metal seems to afford for solving problems that have been troubling industrial scientists.

Titanium possesses about the same strength and hardness as stainless steel, and yet weighs approximately 40 per cent less. It has been used satisfactorily in applications where temperatures run as high as 1300 degrees F. Its resistance to corrosion is said to be as good as that of platinum, and better than that of nickel, stainless steel, and cupro-nickel in sea water and industrial atmospheres that are detrimental to most metals.

Light weight and strength are important properties to aircraft designers, and especially to designers of jet-engine fighters. About 18 per cent of the frame of jet-engine type planes is now constructed from stainless steel; obviously, if titanium were used, a substantial reduction in weight would be achieved. The ability to withstand comparatively high temperatures makes titanium suitable for many components of jet engines, such as engine shrouds, fire walls, and compressor blades. Its non-magnetic properties make it an excellent metal for use in the production of magnetic compasses and magnetometers employed in aircraft.

Ordnance engineers have found that titanium has better characteristics than steel for armor plate and flack deflectors, due to its close-packed crystalline structure. If a sufficient amount of titanium should become available at comparatively low cost, it is conceivable that light airborne tanks might eventually be constructed from this metal, and the weight of arms carried by infantrymen reduced appreciably.

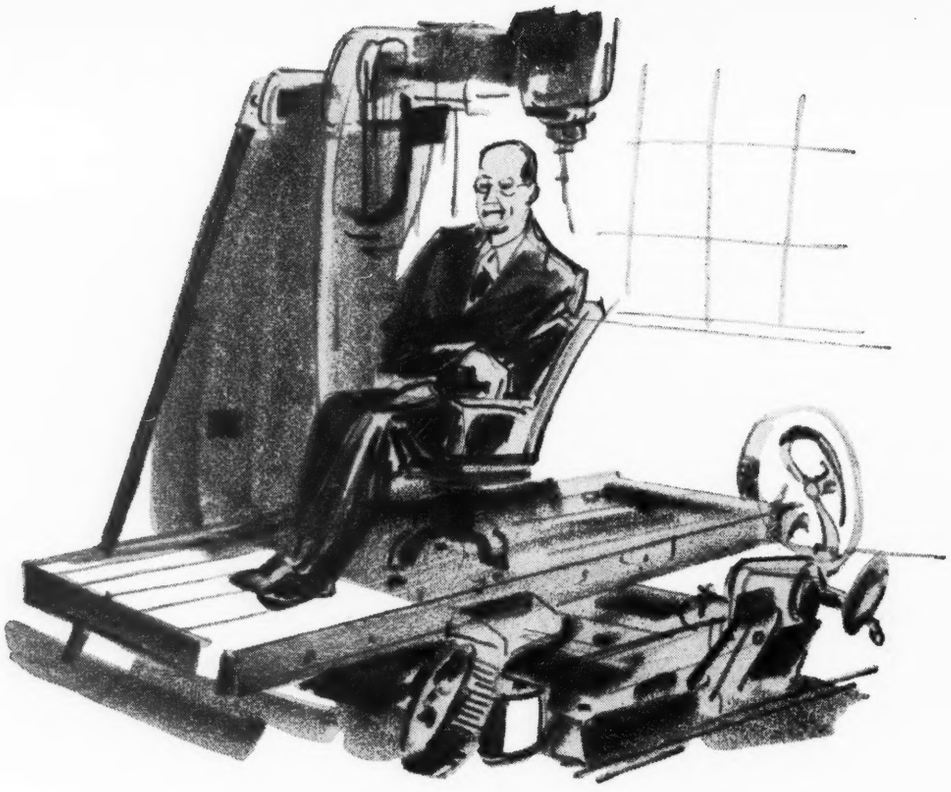
Titanium is not a new element—it is the fourth most abundant structural material in the earth's crust. Large deposits of hard rock ore are found in New York and Canada, while the beach sands of Florida are rich in a titanium placer ore.

If titanium is so abundant, why was it not used long ago in the form of metal? The answer is that the cost of producing it is comparatively high. At a melting point of 3140 degrees F., titanium has a high affinity for oxygen, nitrogen, and other gases, which, by uniting with the titanium, greatly reduce the strength and increase the brittleness of the metal. For this reason, it is necessary to process titanium ore in crucibles and protect it by inert gases or a vacuum. However, with increased demand and a greater amount of technical knowledge, it is believed that this metal will be processed at constantly lower prices during, perhaps, the next ten years. Another former deterrent to the use of titanium has been the unusual problems involved in fabricating it.

The Douglas Aircraft Co. has conducted a great deal of research to determine the practicability of using titanium in aircraft structures, and has applied over 800 titanium parts on a single plane. Special techniques developed for forming and machining these parts are described in the leading article of this number of MACHINERY. The technical data should be invaluable to other concerns who contemplate using titanium in the form of sheets, shapes, and castings.

Charles O. Herb

EDITOR



Don't just sit on it—
SCRAP IT... please!

There it sits—in some corner of your plant—a great big hunk of machinery—its protective coating of oil or grease pot-black with the accumulated dust of years. You know very well you'll never put it to work again!

Sure, that old machine, those tools, dies and other antiquated equipment once represented a heavy investment. But now they've lived their useful lives, paid their way and turned a profit for you. So please get them off to the scrap pile. Send them back to the mills where they'll help make more of the steel American industry needs so desperately.

We urge you to start a scrap drive *now* in your own plant. Of course, your production scrap is moving regularly — it's the heavy solid stuff that's also needed. Remember, we all need more steel. And more steel requires more scrap. So please make up your mind. Give orders to scrap that questionable equipment today.

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Douglas Experience in Working

TITANIUM

Valuable Information on the Characteristics of Titanium and Methods of Working this Material has Resulted from Research Conducted by the Douglas Aircraft Co.

By
O. A. WHEELON, Production Design Engineer
Douglas Aircraft Co., Inc.
Santa Monica, Calif.

TITANIUM has many advantages in the construction of airplanes, according to the experience of the Douglas Aircraft Co. The most outstanding of these is saving in weight, which is, of course, a matter of critical importance in aircraft design. In one Douglas airplane, about 849 titanium parts were used, with a saving in weight of approximately 395 pounds. The titanium parts represented about 5 1/2 per cent of the airframe weight.

In this application, titanium was used where heat resistance was necessary, coupled with light weight, as compared with stainless steel or alloy steels. Structural applications were restricted to a temperature range of 325 to 800 degrees F., and non-structural applications to 325 to 1300 degrees F. In those regions of an airplane that were affected by power plant heat or exhaust, the structure was either partially or entirely composed of titanium. The parts made from titanium included the horizontal control surface skin, aft fuselage skins and frames, and internal structure in the vicinity of the power plant. The non-structural applications included fire walls, shrouding, ducts, fire shields and deflectors, frames, and miscellaneous supports and brackets.

In order to determine fabrication characteristics for design and manufacturing guidance, a series of tests was made, as described in the following. Bending tests were performed to determine local elongation at incipient fractures on annealed material. The tests on material 0.080 inch thick showed a local elongation at fracture of 25 per cent both with and across the grain. This is approximately equal to that obtainable with 0.081 inch thick 24S-T3 aluminum.

It was decided to standardize on a design bend radius of 3 1/2 times the material thickness, which is approximately that used for 24S-T3

aluminum, to provide forming margins. No difference in limiting bend elongation was observed between surfaces of the metal as received from suppliers and surfaces that had been machined.

In making stretching tests on sections, a production Z-frame was employed to establish a method of fabricating these parts. Using a net block and a two-stage stretch with an interstage anneal, followed by stress relieving treatment, produced satisfactory parts. Elongation measured over 2-inch gage lengths varied from 4 to 12.5 per cent. It was necessary to use heat for hand-work subsequent to stretching to avoid cracking.

To produce stretched skins, a stretch block with a severe contour was chosen and an annealed sheet 0.051 inch thick, was stretched until it failed. The part obtained had a 4 per cent elongation over a 2-inch gage length at the crown, and a 7 1/2 per cent elongation adjacent to the fracture. Total elongation over the block was 6.6 per cent, and the width reduction at the crown was 4.4 per cent. The part matched the block contour closely.

Production results were predetermined on crowned skins by employing a planishing hammer to produce a 1/4-inch crown on a 7-inch square annealed sheet 0.032 inch thick. This indicated that skins with a slight curvature in one direction and relatively severe contours in the other could be fabricated by roll-contouring in one direction and crowning with a planishing hammer. Parts of this type are difficult and expensive to stretch in low-quantity production.

A DC-6 rib with a severe shrink flange was formed without cut-outs on a hydraulic press. Practically no shrinkage was obtained, and heat was required for removing wrinkles by hand. Spring-back appeared to be equivalent to that experienced in forming 24S-T3 aluminum, and design limits for this material were used; in the case of titanium, however, approximately twice the forming pressure is required.

In dimpling this material (annealed titanium sheet), it was necessary to employ tools heated to a temperature of 700 degrees F., and to use a dwell time sufficient to exceed a temperature of 500 degrees F. in the sheet. No successful dimples were produced in sheets of work-hardened tempers.

Cold-upsetting of titanium rivets was not successful, but normal upset heads were readily obtained at a temperature of approximately 1400 degrees F. The rivets had a shear strength of 73,500 pounds per square inch. Test samples made with Monel and titanium rivets showed no difference in fatigue life.

Preliminary welding tests were made on annealed material 0.091 inch thick using Argon shielded-arc equipment. The techniques were evaluated according to tensile tests made on the welded joint. In all cases, the elongation was extremely low, being about 1.5 to 2.5 per cent. A joint efficiency of 87 per cent average was obtained. Parts repaired by welding broke as a result of fractures at the bend line in subsequent stretching. As a result, it was decided to avoid welding for operations other than salvage repair.

Some of the difficulties encountered in working titanium occurred in power brake operations. These were traceable to two causes—the tendency of light-gage sheet to pull away from the

Fig. 1. Checking the temperature of a hot-formed titanium section

Fig. 2. Titanium section to be formed in a hydraulic press is placed on a preheated form block and torch-heated to approximately 650 degrees F.

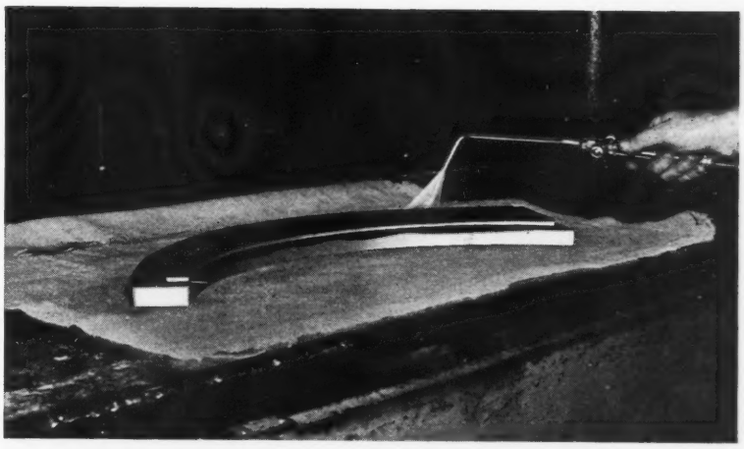


Fig. 3. The hot titanium part and form block are covered with an asbestos sheet to protect the rubber pad on the hydraulic press in which the part is formed

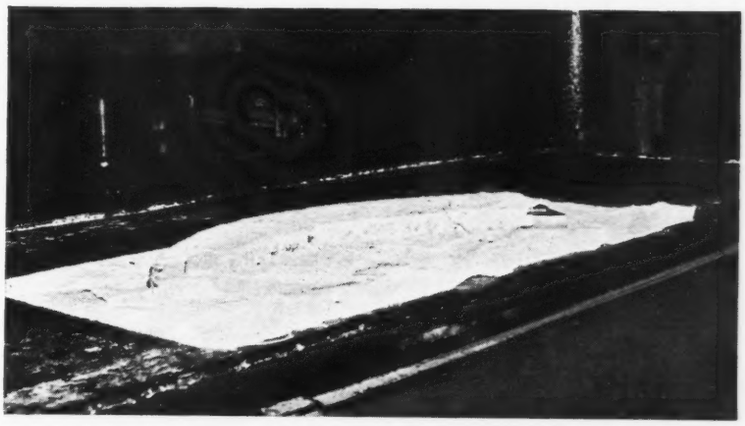
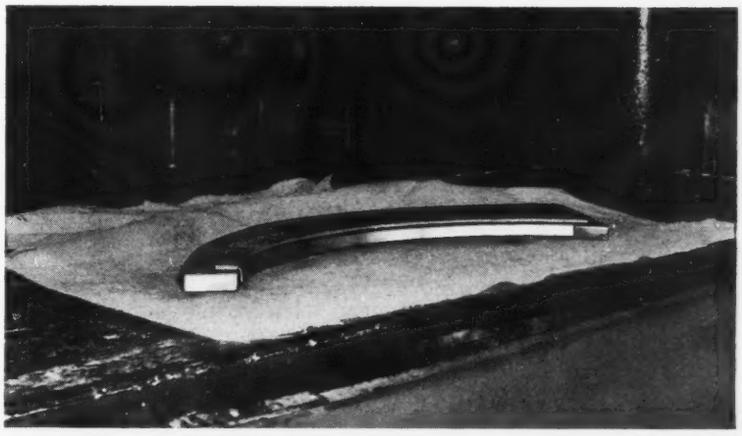


Fig. 4. After being formed in a hydraulic press, the temperature of this titanium part is approximately 400 degrees F.



punch, and material defects. The first difficulty was resolved by the use of a rubber pad that held the material against the punch.

The presence of defects, however, was a much more serious problem. When it became apparent that a prohibitive rejection rate was to be expected with normal procedures, it was decided to utilize hot-forming, since the material showed good response to heat in preliminary tests. Parts were preheated before each bend in a portable oven capable of maintaining a temperature of 875 degrees F. After the completion of the bend, the work had a temperature of 600 degrees F. An electrically heated brake die-holder was also used to maintain a punch and die temperature of 500 to 520 degrees F. Because of the time required to heat the tools to this temperature (five hours), the schedule of operations was arranged so that nearly all parts requiring bends were formed at the same time. Subsequent small-quantity runs were torch-heated prior to bending.

As the use of heat virtually eliminated breakage in bending operations, it is recommended that titanium sheet of the quality now available be hot-formed to prevent high rejection rates. A bend radius of 3 1/2 times the thickness was found practical for annealed sheet that is hot-formed.

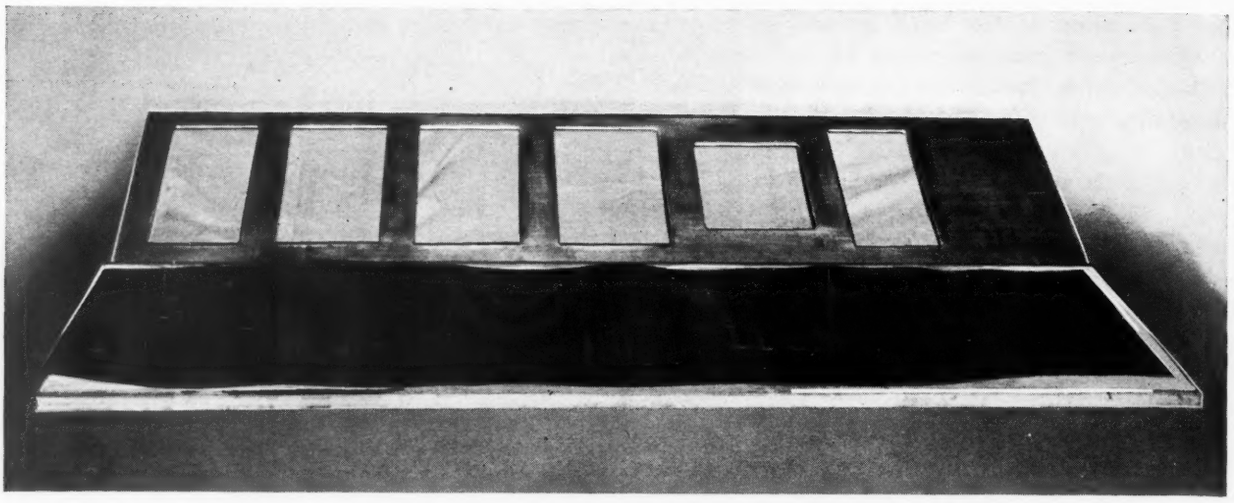


Fig. 5. The beads on this panel, which was made of 0.016 inch thick titanium, were not formed to full depth at 1100 pounds per square inch pressure

In hydraulic press operations, all parts were formed on steel dies with steel pressure plates. Steel dies were used because it was assumed that subsequent forming by hand would be necessary and that much of this work would be done hot. Those parts with shrink flanges were usually formed with wiper rings. It was decided to utilize hot-forming after some difficulty was experienced in production with conventional methods.

Since the quantity of parts was small and the expense of making dies that could be heated was prohibitive, the following procedure was used in hot-forming on hydraulic presses. Form blocks were preheated to a temperature of approximately 200 degrees F. The part was then placed on the form block and heated with a hydrogen-oxygen torch (Fig. 2) until the material turned a golden color (at 600 to 650 degrees F.). The part and form block were covered with an asbestos sheet to protect the rubber pad on the press, as seen in Figs. 3 and 4, prior to forming. The temperature of the parts after forming was approximately 400 degrees F. Any hand-forming required was also done after heating with a hydrogen-oxygen torch. Excellent results were obtained by this method, as practically all cracking in bending radii was eliminated.

The use of heated forming blocks, made to allow for the spring-back experienced with 1/4-hard stainless steel, proved to be generally acceptable for forming titanium. A beaded panel (Fig. 5), was formed of annealed material 0.016 inch thick. The beads were not formed to full depth because of insufficient pressure (1100 pounds per square inch). Warpage was similar to that encountered in 24S-T beaded parts. The part was usable when the edges were tied into the structure. Other typical formed titanium parts are shown in Fig. 6.

It is recommended that optimum forming temperatures be determined for titanium and spring-back charts for use at these temperatures be developed. Electrically heated platens for the dies, as well as portable ovens for heating the parts, would facilitate production. Pressures of approximately 3000 to 5000 pounds per square inch are required for the heavier gages of titanium sheet. The use of 24S-T strain limits with power pressure cut-offs on the die is an approximate guide, which should suffice until more complete data are available.

To produce stretched shapes, stretch blocks were made with no spring-back allowance. Kirksite was used for the form block material. Con-

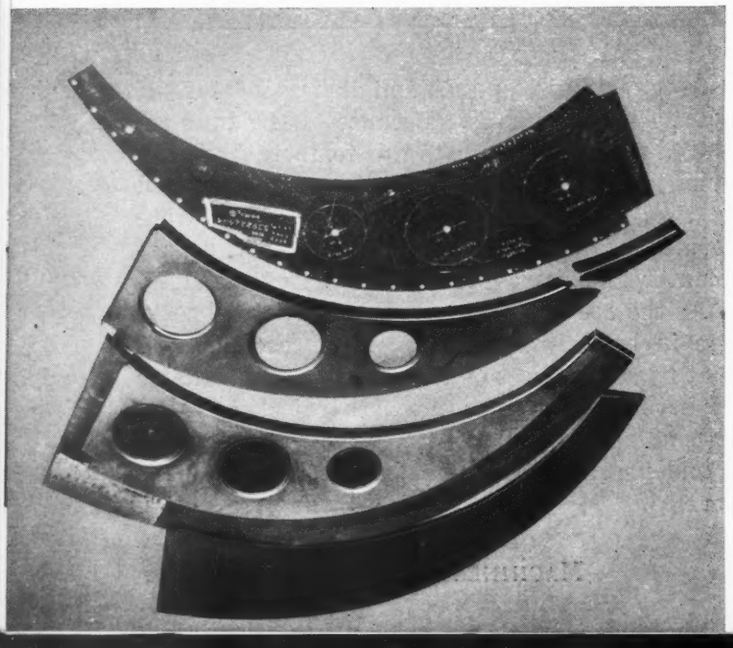


Fig. 6. Typical aircraft parts made of titanium, showing shapes that can be successfully formed

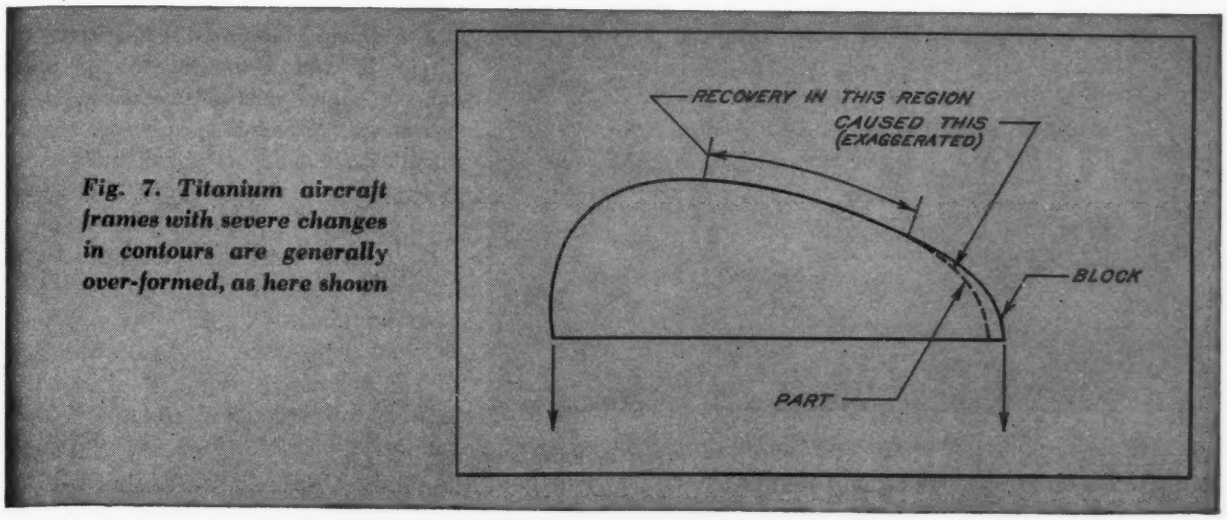


Fig. 7. Titanium aircraft frames with severe changes in contours are generally over-formed, as here shown

tours and bevel angles were checked with an adjustable table set-up and the form block. About one hundred Z-section frames of two types were made on a Hufford stretch press. One type was constructed of 0.081 inch thick titanium, with considerable variation in contour and no return flanges. The second type was 0.040 inch thick, with a fairly constant contour and a return flange on the compressed side.

The first step in fabricating the frames was to form the section in a press brake. Then followed the first-stage stretching operation. After this, the work was annealed at 1300 degrees F. for one hour, and then sand-blasted. Next, the second-stage stretching or sizing operation was performed, followed by a stress relieving operation at 550 degrees F. for two hours. Finally, the sections were checked and straightened.

Dimensional variations in the brake-formed sections caused bevel angle, web depth, and contour discrepancies. Parts having small longitudinal cracks in the bend radii were successfully stretched and subsequently salvaged by welding. Stress concentrations in the form of defects, large cracks from brake operations, and grip jaw indentations caused breakage in the stretching operation. Parts that failed by pulling away from the block were generally salvageable. Some parts also failed in the stretching operation by necking at areas of high strain. Severe local necking without failure caused loss of flange height. This was avoided by allowing sufficient excess material to compensate for the loss, and a trimming operation was added after forming. In an effort to minimize necking difficulties, some parts were stretched cold after having been put in an icebox, but the results were inconclusive. Frames with high webs twisted badly in the first stage because of the fact that sufficient prestretch could not be employed to offset the tendency to buckle on the inner flange in wrapping without fracturing the outer flange. However, the interstage anneal, second stretch, and subsequent hand-work produced satisfactory parts.

Frames with severe changes in contour were generally over-formed, as shown in Fig. 7. In order to set the varying bevel, the outer flange was vibrated while under load. This operation also assisted forming by reducing block friction and by permitting the creep characteristics of the material to work to advantage. Cold hand-work caused breakage, and heat could not be employed with the Kirksite blocks. Thus the parts had to be hot-formed without the assistance of blocks, except for checking.

As a result of these difficulties in stretching, it is recommended that accurate sections be employed prior to stretching. These could be fabricated by rolling or by sizing in a power brake

Fig. 8. Stretched titanium skin on a checking fixture which is used for inspecting the contours

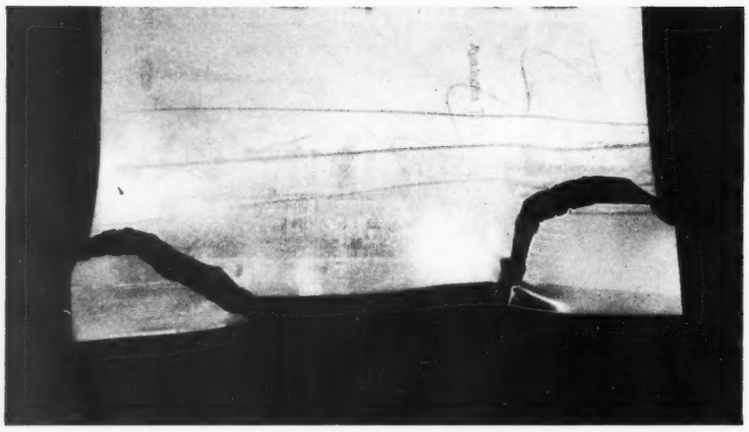


Fig. 9. Thickness variations in titanium sheet sometimes result in breakage of the sheet at the gripping jaws during stretching

or draw bench. Sections should be used with a return flange on the tension side to prevent flange height loss and avoid necking tendencies. The parts should be split, so that regions of high strain with straight or gradual intermediate contours will be avoided. The use of high webs should be avoided on severe contours. A maximum of 10 per cent stretch is recommended, assuming a neutral axis at the inner flange. Stretch blocks should be made of steel to permit the use of heat in hand-work.

In producing stretched and crowned sheet, the stretch-forming of skins was limited by the lack of excess material resulting from gripping requirements. Another limitation was the high cost of tooling in relationship to the number of parts required. Stretch dies were made of Kirksite or plastic without spring-back compensation. Most of the double contour skins were formed by rolling them approximately to shape and producing their contour on the planishing hammer. The contours thus obtained were checked by means of a fixture similar to that shown in Fig. 8.

On the stretched skins, failures resulted from defects in the material and breakage at the gripping jaws due to varying sheet thicknesses (Fig. 9). Slippage in the jaws was minimized by sand-blasting and the use of emery cloth. Holding at maximum load produced the best contours, due to the creep or relaxation characteristics of this material. Rolling and planishing hammer operations were very successful, and accurate contours were achieved. Some marking of the work resulted from blisters and inclusions.

For limited quantity production, experience indicates that roll-forming and planish-hammering will produce accurate and satisfactory parts. In general, normal stretch press practices may be employed provided good quality material is used.

Practically all formed parts require a subsequent check and straightening by hand, which

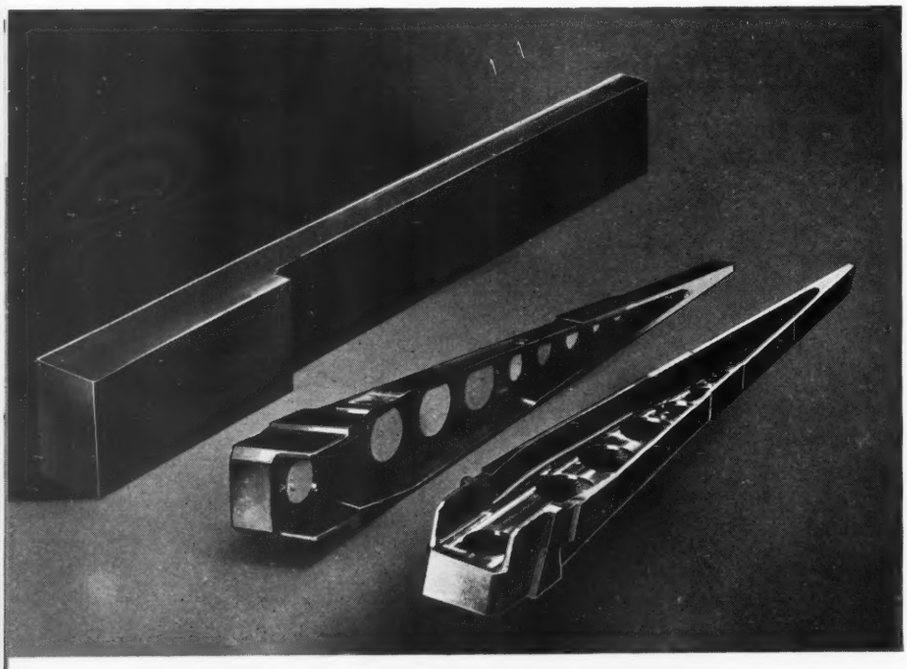


Fig. 10. Titanium fittings machined in shape of tapered channels from annealed hand-forged bar stock

cannot be performed at room temperature without breakage. For this work, torch heating was employed, and the parts were heated to approximately 750 degrees F. The temperature was controlled by color indication, the material turning blue at that heat. In cases where lightening holes had been blanked and formed on the punch press, torch heating was required to avoid breakage.

Indications were that drawn titanium parts would require heated dies, the same as magnesium. The only drop-hammer part attempted (a double contour skin) was not successful, due principally to spring-back. It is felt, therefore, that drop-hammer operations should be avoided.

As regards machinability, commercially pure titanium is comparable to stainless steel in general. The chief source of trouble in machining this material was caused by work-hardening, which occurred when taking light cuts. Deep cuts minimize this problem.

Milling was accomplished with standard 1 3/8-inch diameter, two-, and four-fluted high-speed steel end-mills at 250 R.P.M., with feeds of 0.008 inch per revolution. The lubricants and coolant used were the same as those employed for stainless steel. Drilling annealed titanium was accomplished with a hand-feed, using standard high-speed steel drills running at 675 R.P.M. Penetrating oil was used as a lubricant. Tapping was done with high-speed steel taps and the same lubricant.

The major difficulty encountered in machining, drilling, spot-facing, counterboring, and tapping titanium was the tendency for the cutters, drills, and taps to lose their cutting edges quickly. Some drills required resharpening after each hole was drilled. One tap was deliberately broken off in the hole and extracted with a Thompson tap extractor (a burning out process). Upon inspection of the tapped hole, it was found that the threads were not damaged by this operation.

The tendency to warp as a result of machining was greater than it is with cold-rolled steel or stainless steel, and almost all the parts required straightening after machining.

Several fittings in the shape of a tapered channel, about 2 by 3 by 20 inches, were machined from annealed hand-forged bar stock, 2 by 3 1/2 by 26 inches (Fig. 10). It was planned to rough out the parts by means of a band saw in order to obtain some scrap bar for other tests. This required a cut 3 1/2 inches deep by 12 inches long. Every attempt to make this cut by sawing —from heavy-feed, slow-speed cutting (35 feet per minute) to friction sawing at 9000 feet per minute—was unsuccessful. An effort to make the cut on a power-feed table saw was without success.

Finally, these titanium parts were slit-milled through almost the entire thickness, and then the remaining distance (1/8 inch) was cut with an 8-pitch band saw at 50 feet per minute, using a hand feed. After roughing, the parts were machined without difficulty in the usual way. The resulting finish was better than 100 micro-inches r.m.s. Several small pieces of scrap bar were smoothed on a bench grinder. No particular fouling of the wheel was noticed.

The general processing of titanium parts included degreasing prior to all heating operations and at the completion of fabrication. In cases where forming or straightening was carried out in a die or hammer containing lead, Kirksite, or low melting alloys, the parts were cleaned in a nitric acid bath prior to heating and as a final operation.

All parts other than exterior skins were sandblasted after hot operations or thermal treatments, exterior skins were brightened by a two-second hydrochloric acid dip. At interstage annealing, the parts that had been properly cleaned were placed in an air furnace maintained at 1300 degrees F., plus or minus 25 degrees F., and allowed to remain there one hour. Clean parts that were to be stress-relieved were placed in a furnace at 550 degrees F., plus or minus 10 degrees F., and kept at that heat for two hours.

In general, conventional assembly operations were employed, and no unusual problems were encountered.

Selecting Transformers for

How Standardization of the Sizes and Ratings of Transformers for Machine Tool Controls Eliminates over Ninety Per Cent of the Number of Transformers Previously Required and Simplifies Selection

DURING World War II more than 250 different sizes and ratings of transformers were used for machine tool control applications. This wide variety of sizes and ratings resulted in procurement difficulties for manufacturers, distributors, retailers, servicing organizations, and consumers.

It is essential in the present emergency that we learn from past experience, and apply the necessary principles of standardization to achieve maximum cooperation with the machine tool industry. With this in view, a survey was taken of this industry's requirements to determine the minimum number of control transformers that would adequately cover the necessary transformation in electrical circuits. As a result, it was possible to reduce the number of ratings from more than 250 to 23. A co-feature of the survey was the redesign of these transformers to effect a more efficient utilization of panel space.

The term "machine tool" covers a wide variety of machines, such as milling machines, boring mills, drill presses, turret lathes, screw machines, and similar equipment. The low-voltage electrical circuits on these machines may be reduced to two functional components—control and lighting. The former consists of relays and starters for the drive motors on the machines. Since both types of loads are generally standardized at 115 volts, a transformer is necessary to step down from the shop-line voltage, which is usually between 230 and 575 volts.

An analysis of the ratings of transformers produced by one company during the last five years reveals that over 250 separate designs were made during this period, and in many instances, there was a difference of only a few volt-amperes, or a tap voltage, between the units. A study was made to determine the maximum utility of a given rating, with the result that twenty-three ratings were recommended to replace all of the previous units. Such standardization will prevent any further duplication of ratings in the future.

Over 75 per cent of the transformers previously furnished had a 230/460-volt series-multiple primary with a 115-volt secondary at 60

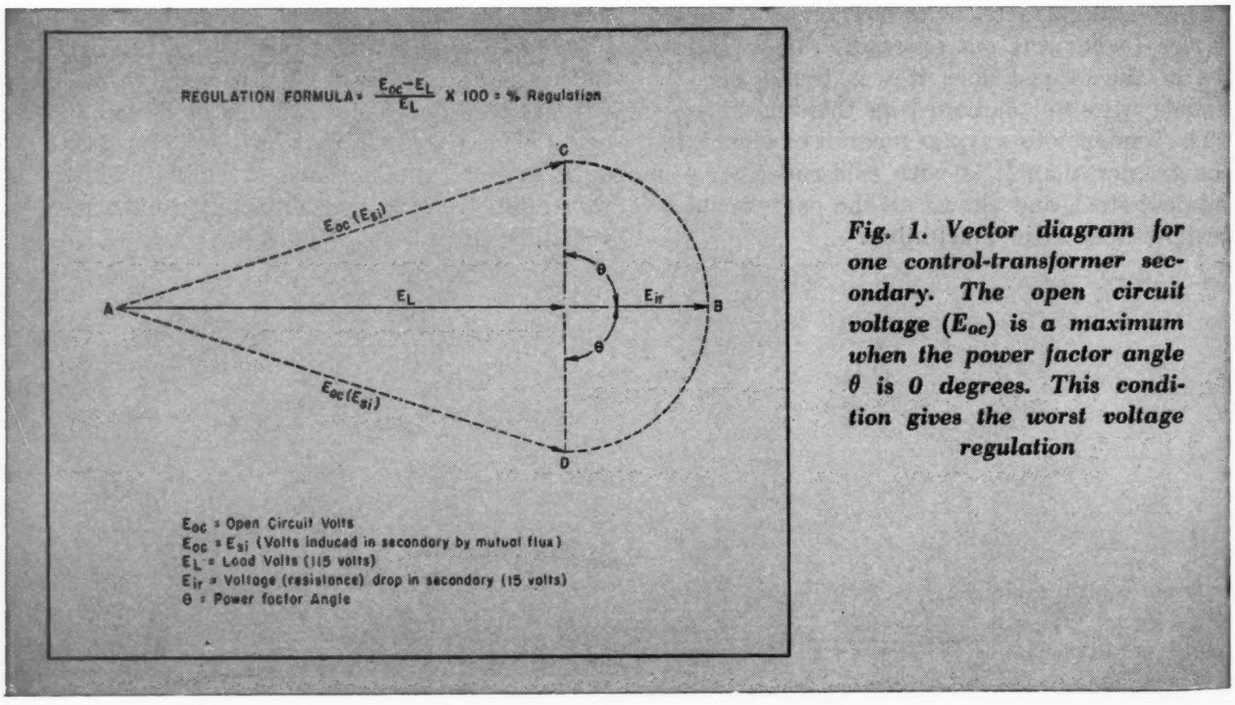


Fig. 1. Vector diagram for one control-transformer secondary. The open circuit voltage (E_{oc}) is a maximum when the power factor angle θ is 0 degrees. This condition gives the worst voltage regulation

Machine Tool Controls

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cycles. The following series may therefore be recommended: 60 cycles, 230/460 volts primary, 115 volts secondary, with KVA ratings of 0.075, 0.150, 0.250, 0.350, 0.500, 0.750, 1.000, 1.500, 2.000, or 3.000. This series covers what might be termed the "domestic requirements" in the machine tool industry.

The export market requires, almost entirely, 50-cycle transformers. Partly because of the poor regulation in many foreign countries, the voltage requirements are considered, by American manufacturers, to be special. It is recognized that there are some 50-cycle areas in this country, and also special voltage requirements in the 60-cycle field. Since it is common practice to use 60-cycle motor starters on 50-cycle circuits, at reduced voltage, a 95-volt tap in the secondary must be included for this purpose. Approximately 20 per cent of the business may be grouped in this general classification, and, for this service, the following transformer ratings may be recommended:
50/60 cycles, 208/230/380/400/416/460/500/575 volts primary, 115/95 volts secondary, with KVA ratings of 0.150, 0.250, 0.350, 0.500, 0.750, 1.000, 1.500, 2.000, or 3.000.

These voltages not only provide flexibility for the ultimate user, but will also allow the machine tool manufacturer to test his equipment at standard domestic voltages.

The remainder, or about 5 per cent of the business, is in the 25-cycle class. Here, again, the industry requirements were analyzed on the basis of past activity, and it was found that the market can be adequately covered with transformers of the following ratings: 25 cycles, 230/460/575 volts primary, 115 volts secondary, with KVA ratings of 0.150, 0.250, 0.350, or 0.500.

Provision for Circuit Protection

It is necessary to provide some form of protection for the transformer and its auxiliary circuit. This may be accomplished by the use of fuses or circuit-breakers of either the thermal or magnetic type. The use of circuit-breakers as an integral part of the transformer construction is desirable, because there is no problem of replacement, and a manual reset button allows the operator or electrician to conveniently and rapidly reclose the circuit. In addition, the circuit is always protected at the same predeter-

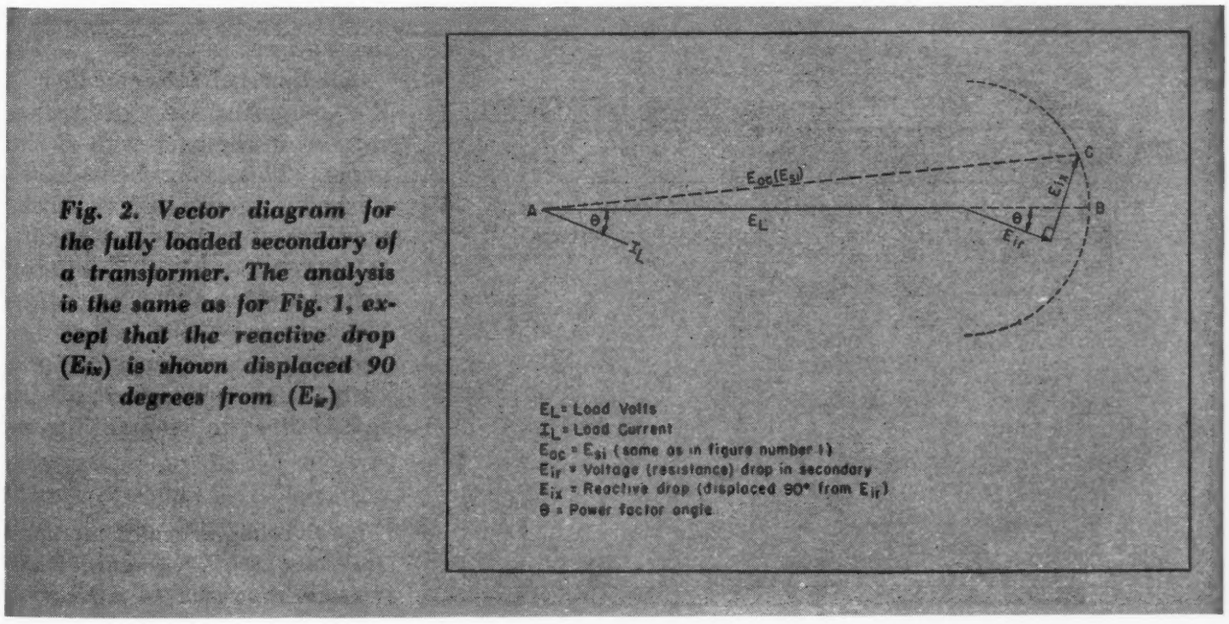


Fig. 2. Vector diagram for the fully loaded secondary of a transformer. The analysis is the same as for Fig. 1, except that the reactive drop (E_{ix}) is shown displaced 90 degrees from (E_{ir})

mined level, whereas replacement fuses may be incorrectly used at a higher or lower rating than the original. Further, the circuit-breaker has time-delay action which will permit predetermined momentary overloads.

Simplification of Transformer Connections

One difficult problem in the past was that of connecting the transformer into the circuit after it had been installed in the panel. This necessitated the splicing of both primary and secondary leads—a costly and tedious operation when working in a confined space. Of course, this difficulty was repeated in the field each time any reconnections were necessary.

The solution to this problem was provided by the use of a terminal board, properly mounted on the transformer. This terminal board, designed to withstand shock, is provided with barriers to prevent accidental short-circuiting of the adjacent terminals. The terminal board carries the identifying terminal nomenclature in large, clear numbers, which can be easily read by the individual making the connections. In addition, the terminal board is parallel with the face of the transformer, so that connections can be made from the front of the open panel. The use of screw type solderless connectors facilitates making rapid, yet firm, positive connections to both incoming and outgoing leads.

Importance of Diagrammatic Nameplates on Transformers

The nameplate is one of the most important components on transformers for machine tool applications. It carries, of course, such information as catalogue number, frequency, kilovolt-amperes, voltage, and serial number; in addition, it should show a schematic wiring diagram of the transformer windings, clearly identifying all tap voltages. The nameplate should be located on the front of the transformer, plainly visible from the front of the open panel. The workman may thus easily and positively identify the lead markings on the nameplate with the terminal board nomenclature. This eliminates any need for reference to blueprints and virtually removes any possibility of error. Any subsequent change of connections in the field can be made rapidly without the need of reference prints.

Minimum Size and Mounting Arrangement

The size of the control panel is important in machine tool applications, since it imposes definite limitations on the volume of the transformer. There is one guide that can be used in determining the depth of transformers designed for panel mounting. This is the dimension of the motor starters. The depth of the panel itself is regulated by the starter dimensions, and, of course, the transformer, plus sufficient allowance for electrical clearance, must not exceed the panel depth.

Another point to consider is the mounting of the transformer on the back wall of the panel. This can be accomplished by means of two conventional brackets, each containing two slotted holes for bolt mounting. The mounting brackets must not extend beyond the core dimension of the transformer, since here, again, it is desired to keep all dimen-

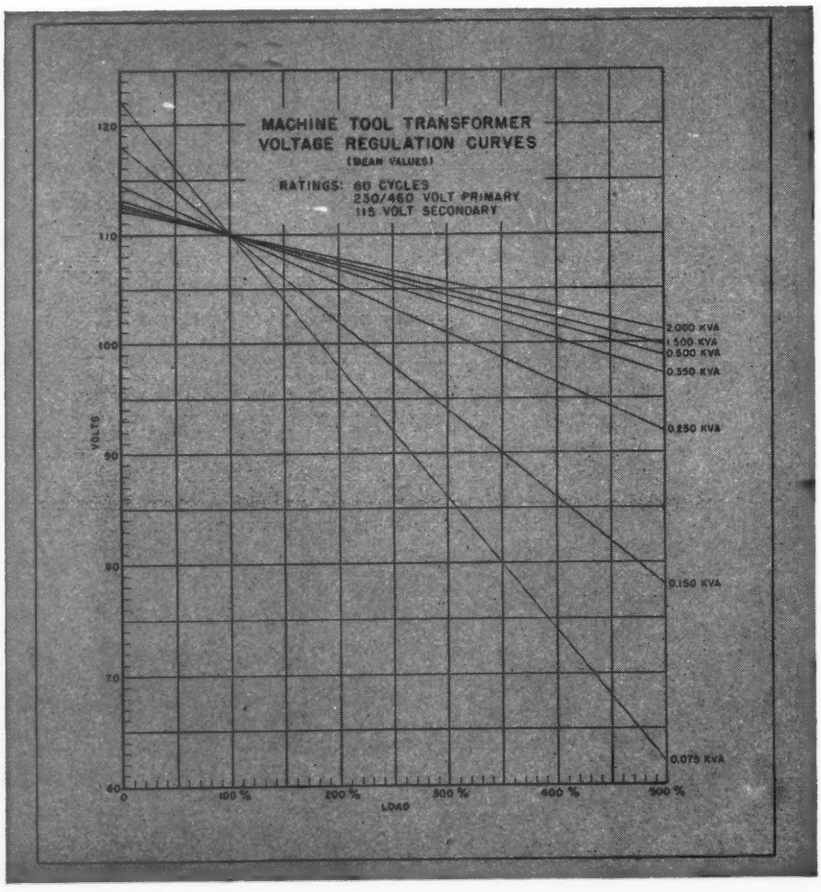


Fig. 3. Voltage regulation curves for some of the standard transformers described in this article

Fig. 4. Typical transformer construction employed for machine tool control applications requiring 0.200 KVA or less

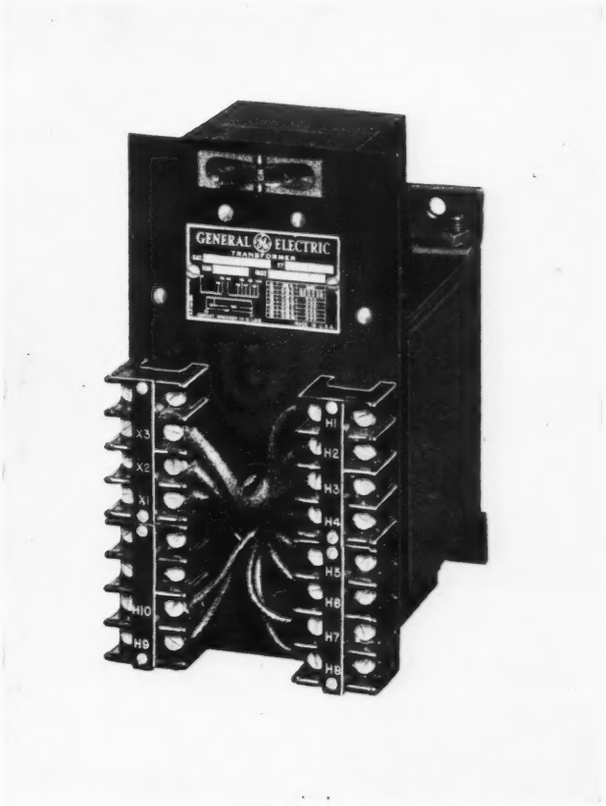


Fig. 5. Transformer with a built-in circuit-breaker and terminal board, used for ratings requiring more than 0.200 KVA

sions to a minimum. The mounting bolts should, however, be accessible from the front of the panel in order that a screwdriver or speed wrench can be used with a minimum of effort.

Although these transformers are panel-mounted, the machine tool manufacturer must provide sufficient room and ventilation to prevent overheating. In other words, the transformer, itself, is designed for a conventional 55 degree C. rise above a 40 degree C. ambient temperature. In addition, it is required to meet the other NEMA standards associated with specialty transformers.

Transformer Regulation

Because of the lack of published information on the subject, the question of transformer regulation has caused considerable misunderstanding in the past. In designing the low-voltage control circuit, the machine tool electrical engineer is frequently at a loss to select the proper transformer, since he has no specific regulation information available that refers to a transformer of definite KVA rating. He knows the in-rush conditions of his starters, and also the minimum voltage needed to "hold in" the solenoid, but where can he find the transformer with the proper regulation characteristics to satisfy his conditions?

Here, again, the important minimum size factor appears, as, obviously, he wants to use the smallest transformer that will satisfy his circuit requirements. In addition, the transformer must have proper regulation, and it must be large enough to operate continuously under steady-state conditions without overheating.

A partial answer to this problem was provided when a complete set of regulation curves was made available for each rating of the standard line of transformers. These curves alone, however, are not sufficient, since the effect of power factor on the regulation curves must be considered. This is important, as the power factor is relatively low on control circuits during in-rush conditions.

It is, therefore, necessary for the regulation curves to reflect actual voltages at the power factor that gives poorest regulation. Contrary to popular belief, the regulation does not continue to increase as the power factor decreases. In other words, any given transformer has its poorest regulation at one specific power factor; at power factors above or below this value, the regulation improves.

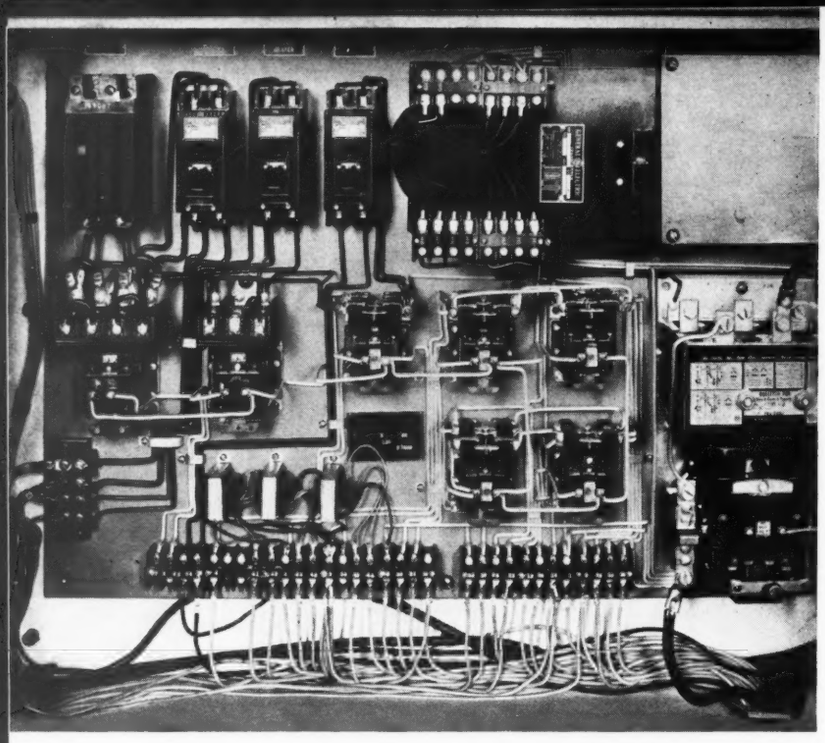
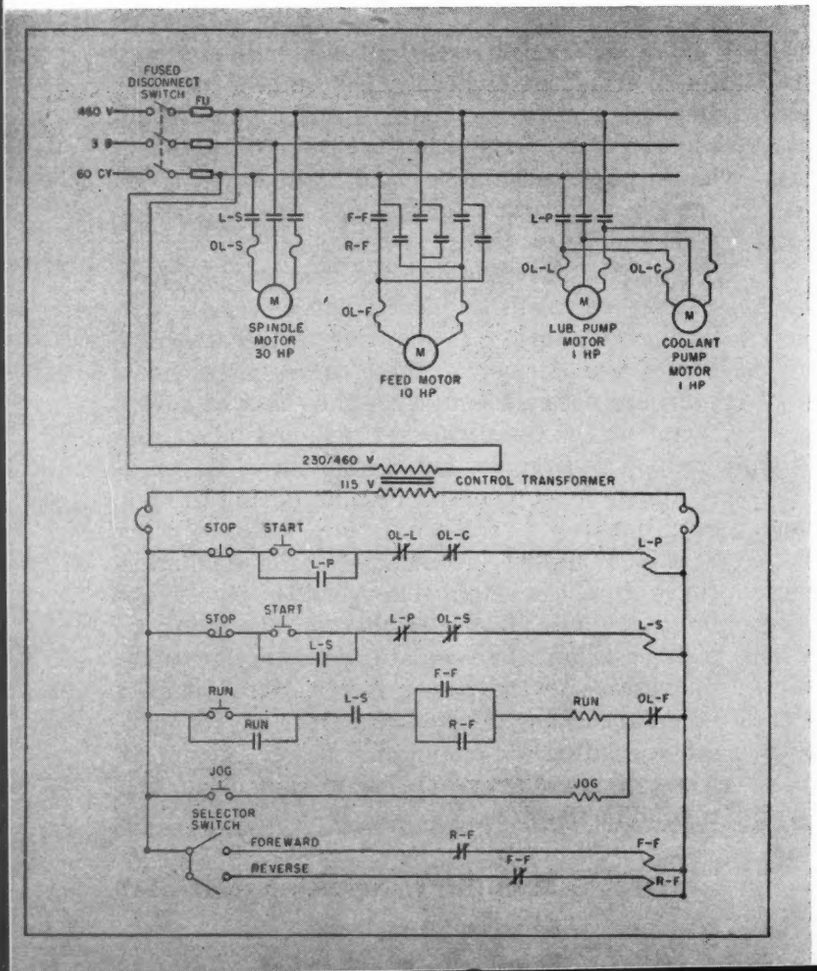


Fig. 6. Machine tool transformer mounted on the control panel of a machine tool

Fig. 7. Schematic wiring diagram of a typical machine tool electrical circuit



In addition, control transformers (0.200 KVA and below) have their worst regulation at unity power factor. This is caused by the almost complete absence of reactance in the unit. The vector diagram (Fig. 1) of one control-transformer secondary will illustrate this point. Note that at unity power factor *AB*, the voltage drop in the secondary due to pure resistance E_{ir} is in phase with the load voltage E_L. Thus, the induced voltage in the secondary, or open circuit voltage, E_{oc} is at its maximum, being the arithmetical sum of E_L and E_{ir}. This is, by definition, the condition of worst regulation, as can be seen by substituting in the regulation equation:

$$\text{Per Cent Regulation} = \frac{(E_{oc} - E_L)}{E_L} \times 100 = \frac{(130 - 115)}{115} \times 100 = 13$$

Now, as the power factor angle θ increases (either leading or lagging), approaching 90 degrees as a limit, it becomes evident that the value of E_{oc} is decreasing. This is true, since E_{oc} terminates on the arc of a circle of radius E_{ir}, and E_{ir} is constant in magnitude. At the extreme condition of zero power factor lagging, or a pure inductive load, we reach the point where

$$E_{oc} = AD = \sqrt{(E_L)^2 + (E_{ir})^2} = \sqrt{(115)^2 + (15)^2} = 115.5$$

and

$$\text{Per Cent Regulation} = \frac{(115.5 - 115)}{115} \times 100 = 0.44$$

The same condition is true at zero power factor leading, or a pure capacitive load. It becomes obvious, therefore, that regulation curves for transformers of 0.200 KVA and below need only be shown for a unity power factor to provide the worst possible conditions.

In utilizing transformers above 0.200 KVA, the reactance must be taken into consideration. The vector diagram for this condition (Fig. 2) shows the fully loaded secondary of a transformer.

The analysis of Fig. 2 is the same as for Fig. 1, except that the reactive drop E_{ix} is shown displaced 90 degrees from E_{ir}. Note that E_{oc} terminates at a point *C* on the arc. As the power factor de-

creases—that is, as the angle θ increases—E_{oc} will increase until it coincides with AB, or becomes, in other words, a maximum. At this power factor, we will have the poorest regulation. Conversely, at any power factor above or below this value, the regulation will improve.

The power factor at which any transformer will reflect its worst regulation depends upon the relationship between resistance and reactance. It is, therefore, only necessary for the transformer design engineer to determine the relationship between E_{1r} and E_{1x} and plot his regulation curves accordingly. The machine tool manufacturer may then use the curves confidently, realizing that the worst possible conditions are being met.

These conditions may also be proved mathematically by substituting various values for θ in the formula:

$$E_{oc} = E_L + I_2 (R_2 + JX_2) (\cos\theta - J \sin\theta)$$

where the sub-script 2 refers to secondary values, and the summation indicated is vector addition.

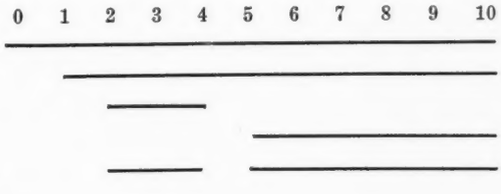
Fig. 3 shows typical regulation curves for some of the transformers discussed in this article. Examples of standard type machine tool transformers are shown in Figs. 4 and 5. Fig. 4 illustrates the type of construction employed with ratings of 0.200 KVA and less, while Fig. 5 shows that used with ratings above 0.200 KVA. A typical panel installation of a machine tool transformer is illustrated in Fig. 6.

An example will serve to illustrate the simplicity of applying this standardized line of transformers. The machine tool designer needs only the tabulation of ratings and regulation curves. Assume that a transformer is to be selected for a typical machine tool electrical circuit such as shown in Fig 7. The necessary steps and calculations would be as follows:

First, a list of the electrical devices and the current requirements is made, as given below.

Function	Type	Coil Current, Amperes: In-rush	Coil Current, Amperes: Holding (at 115 Volts)
L-P	Size No. 1	1.52	0.26
L-S	Size No. 3	8.50	1.00
F-F	Size No. 2	6.40	0.57
R-F	Size No. 2	6.40	0.57
Run	Control Relay 4. Pole Size No. 00	0.54	0.11
Jog	Control Relay 4. Pole Size No. 00	0.54	0.11

Second, the operating cycle of devices is laid out:



Third, load calculations are made for the conditions given:

For maximum steady-state load, the devices energized and the corresponding load, in amperes, are:

Devices Energized	L-P	L-S	F-F	Run
Load, Amperes	0.26	1.00	0.57	0.11

Then the load is:

$$\text{Load} = (115 \text{ volts}) (0.26 + 1.00 + 0.57 + 0.11) = 0.223 \text{ KVA}$$

For maximum momentary load, the devices energized are L-P and L-S, and the corresponding device pick-up is 0.26 and 8.50 amperes.

Then:

$$\text{Load} = (98 \text{ volts}^*) (0.26 + 8.50) = 0.860 \text{ KVA}$$

This particular example has a lighting load of 100 watts operating from the transformer secondary; therefore:

Total steady-state load = 0.223 + 0.100 = 0.323 KVA
Total in-rush load .... = 0.860 + 0.100 = 0.960 KVA

The final step is to select the smallest transformer that is capable of supplying the steady-state load, and yet have sufficient regulation to give a minimum of 85 per cent of nominal voltage (98 volts) under in-rush conditions. Normally only two initial selections are necessary from the standard line before determining the correct rating. These two sets of ratings are:

Total in-rush load	0.960 KVA	0.960 KVA
Transformer rating	0.350 KVA	0.500 KVA
Per cent load	275	192
Output voltage (from Fig. 3)	104	107

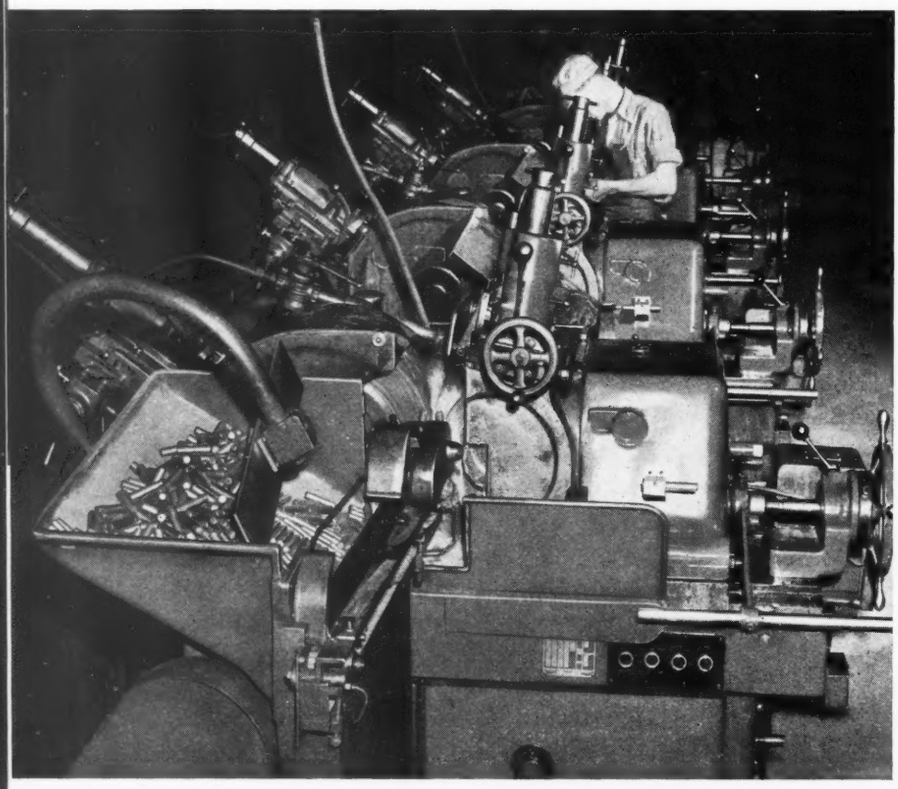
It is evident that the 0.350-KVA transformer with a secondary voltage of 104 at 0.960 KVA in-rush is adequate to supply the system. This transformer would have a standard rating of 60 cycles, 0.350 KVA, 230/460 volt primary, 115 volt secondary.

In this case, standardization not only simplifies the problem from the standpoint of selecting the proper size transformer, but also provides a unit functionally designed for the application. Transformers designed in accordance with the principles outlined save both time and space of installation—an important consideration in the machine tool industry.

Also, the consolidation of ratings reduces inventory and ordering problems, as transformers of relatively few ratings need be kept in stock to cover a large number of applications. The time has come when the machine tool manufacturer can expect to buy transformers that are designed to solve his problems economically and conveniently and to provide the greatest flexibility to him and his customers.

*Assume 85 per cent of line voltage as a minimum pick-up value.

Machining and Assembling



By F. D. FOREMAN
Superintendent, Motor Division
and
E. B. ROGERS
Foreman, Cylinder Machining
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A HIGHLY efficient production line has been set up by the Studebaker Corporation, South Bend, Ind., for machining and assembling cast-iron valve guide bushings used in the cylinder heads of V-eight engines. The cast bushings, which are 5/8 inch in diameter by 3 inches long, are shoveled into the hopper seen at the left foreground in Fig. 1, from which they are automatically fed through the line of four Cincinnati Feedmatic centerless grinders shown.

In rough-grinding on the first centerless machine, the diameter of each casting is reduced to 0.595 inch, and on the second machine to 0.575 inch. The tolerance maintained in both operations is $\pm$ 0.002 inch. After semi-finish grinding

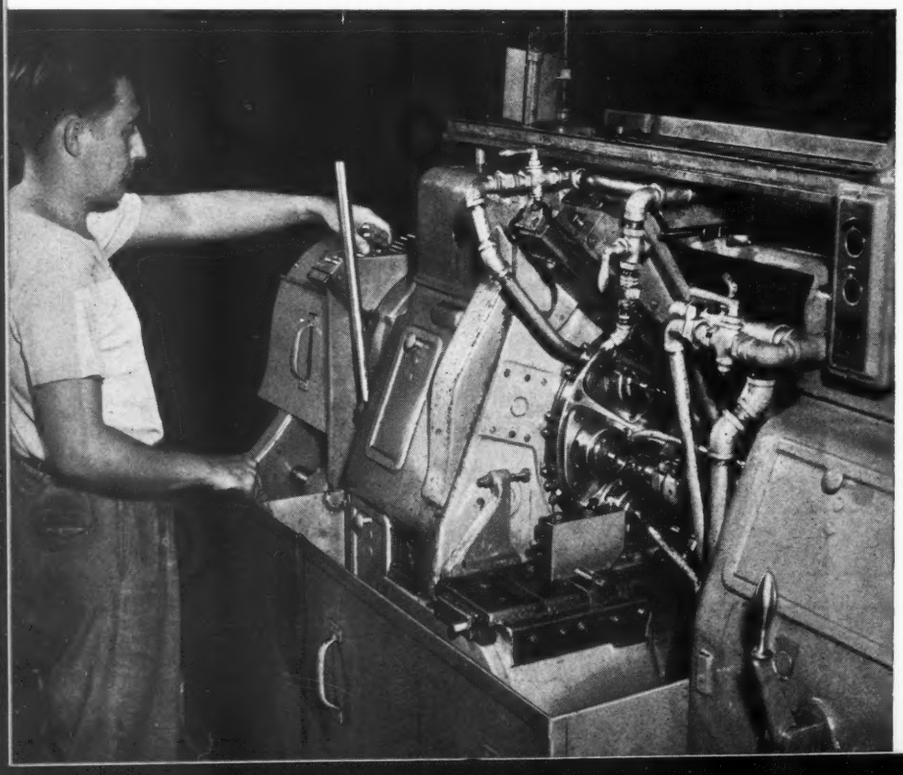


Fig. 1. (Above) Line of four centerless grinding machines equipped with a hopper and a conveyor that feeds cast-iron blanks for valve guide bushings through machines at rate of 1500 per hour

Fig. 2. One of the two six-spindle automatic screw machines equipped with automatic hopper feeds for drilling and reaming valve bushing holes and also chamfering one end of each bushing

Valve Bushings at Studebaker

Fast Processing of Valve Bushings for Automotive Engines Includes Centerless Grinding of Castings; Chamfering, Centering, Drilling, and Reaming in Automatic Screw Machines; and Precision Boring in a Special Set-Up. A Hydraulic Assembly Machine Presses Valve Bushings into the Cylinder Heads under Predetermined Pressure

on the third machine, the diameter of the bushings is 0.567 ± 0.002 inch, and after finish-grinding on the fourth machine, 0.5637 ± 0.0005 inch. Both inlet and exhaust valve bushings are ground simultaneously, and they issue from the end of this row of grinders at the rate of 1500 an hour. All bushings are then fed through an automatic washing machine to remove any abrasive that may be left on the surface.

Secondary operations for producing the axial holes through the solid castings are performed next in a pair of Acme-Gridley six-spindle, automatic screw machines, one of which is seen in Fig. 2. The centerless ground blanks are carried by a roller conveyor from the washer in tote pans, and are loaded by handfuls into the hopper at the head end of the screw machines. From each hopper, loading into the spindle collets is accomplished automatically, as are also all cuts made in these machines.

One of the two screw machines processes inlet valve bushings and the other exhaust valve bushings, the operations on both being the same. The spindle speed in both cases is 1161 R.P.M. At the first station, a center is drilled, and the outer end of each bushing is chamfered with a carbide tool. At the next four stations, high-speed steel drills produce the long through hole that forms the bore of the bushing in four stages. In the sixth and final position, a Carboloy reamer sizes the bore to a diameter of 0.323 inch, and the bushing drops out into a chute, ready for final boring.

For the final boring operation, a Hoern & Dilts vertical, automatic indexing machine is employed. Two of the five stations on this machine are shown in Fig. 3. Each station is equipped with two Majestic automatic, self-centering chucks, above which are slides carrying high-speed steel boring-bars with carbide bits. The chucks are automatically stopped and opened at the loading station, shown at the right, where two work-pieces are seen being inserted by hand. One of the bushings has not yet been bored, and the other has been bored half way through in a previous passage through the machine, and is

Fig. 3. Two of five stations on an automatic indexing machine that bores valve guide holes in pairs. Loading is done at right-hand station where self-centering chucks stop automatically

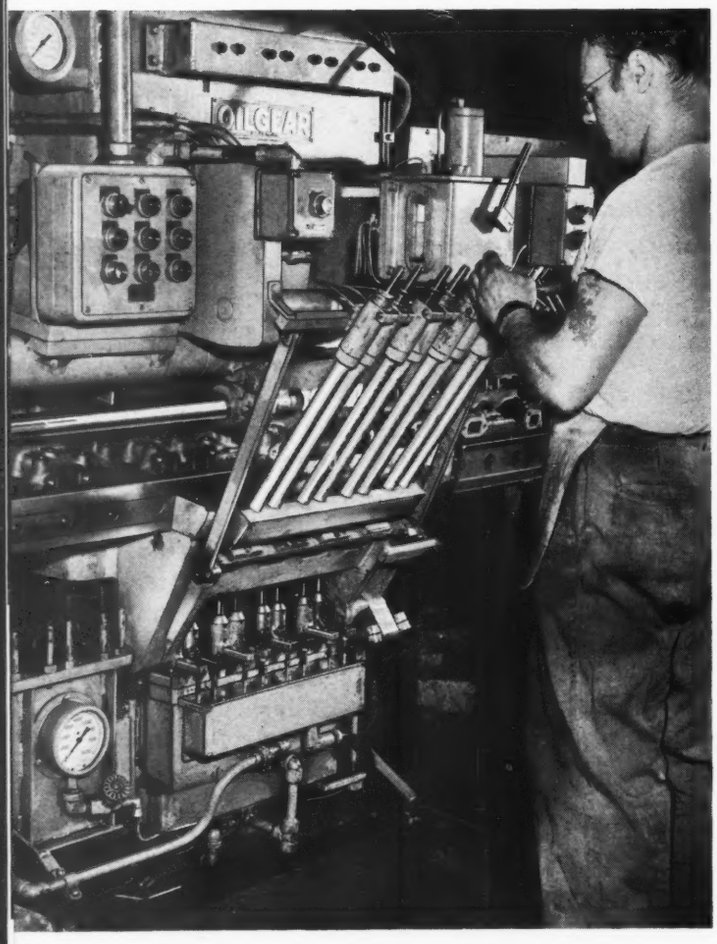


Fig. 4. Special assembly machine being loaded with machined bushings that are pushed into holes in the cylinder heads. The fixture seen below the cylinder head has been rocked forward to receive a bushing over each pin

Fig. 5. (Below) Same machine shown in Fig. 4, but with the fixture elevated for pushing the bushings into the cylinder-head holes

changed end for end for finishing the remainder of the bore.

This arrangement permits using shorter and, consequently, stiffer boring-bars than would be the case if they had to be long enough to bore the full length of the holes. With this set-up, each bushing is carried around the machine twice while boring first one end and then the other. In boring the hole through the bushing, about 0.005 inch of stock is removed per side, the bore diameter being increased to 0.3330 ± 0.0005 inch. Except for loading and unloading, the machine operates automatically, the production rate being 900 bushings per hour.

Final sizing of the bushing bore is accomplished by hand reaming, using a Carboloy tool that removes from 0.0002 to 0.0005 inch of stock. The reamer extends through the entire length of the bore, thus insuring that the holes bored from both ends of the bushing will be in line, and that there will be no step where the two holes join.

With the final reaming of the bore, the bushings are completed, except for a final washing, which takes place before they are delivered to the Oilgear assembly machine seen in Figs. 4 and 5. This machine was designed especially to press eight bushings at a time into cylinder-head holes previously sized to receive the bushings. Loading is done by hand, the bushings being placed into eight inclined tubes, each of which holds several bushings.

The hydraulic assembly machine is located near the end of the cylinder-head machining line. As the heads leave the line, they move horizontally along a track and are automatically positioned in the assembly machine. Below the cylinder head is a fixture that is given both a rocking and a reciprocating motion. When the engine head moves into position, the fixture rocks so that eight integral pins come in line with the loading tubes in the machine. In this position, eight bushings drop from the tubes, and one bushing slips over each fixture pin. Next, the fixture rocks back and brings the bushings into line with holes in the cylinder head, which, in the meantime, has been clamped securely above the fixture. Then the fixture is elevated automatically, as seen in Fig. 5, and all eight bushings are pressed into the holes in the head.

The assembly machine is so constructed that it will stop if the pressure required to press any

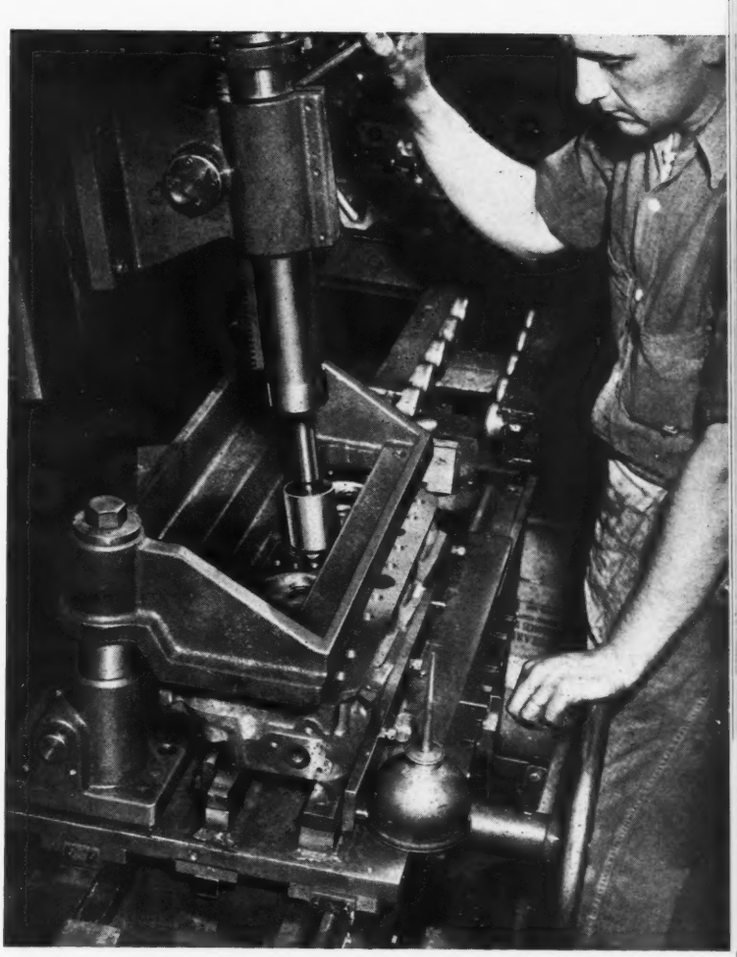


Fig. 6. Valve seats are machined by a floating tool that pilots on a spiral reamer passing through each valve bushing hole. A light cut is made by the reamer if the bushing bore has been reduced in diameter at assembly

bushing into place is either above or below a preset value. When this occurs, a red light or lights go on automatically to indicate which bushing or bushings do not fit properly. Then the operator must either change the bushings or mark the head to have the hole resized, provided, of course, that the hole is not already above the maximum size permitted. Thus, the machine insures that the bushings have a proper press fit in the head without any gaging or selective matching. The operation is fast, and there is no possibility of cracking a head by forcing into it a bushing that is too large.

To avoid the possibility that the bores in the bushings might be compressed during assembly below the minimum diameter permitted, and perhaps result in the valves sticking, the heads, after passing through the assembly machine, are advanced to the valve-seating line seen in Fig. 6. Here the heads are clamped in a longitudinally indexing fixture, which brings the bushings successively into line with the spindle of a drill press equipped with a floating chuck. In the chuck is a reamer having spiral flutes and cutting edges that cut under-size bushing bores and bring them to size. Carried in the same chuck is a valve seating tool which is piloted by the reamer, so that it will run concentric with the bushing bores. This tool has to run slowly because the valve-seat rings are made from high-speed steel to resist wear and erosion.

On the valve-seating line, there are four fixtures and drill presses of this type, each with its own operator. These four machines process 112 heads per hour, thus keeping step with the line for machining the heads. A 100 per cent inspection of the completed cylinder heads is made by three men, who use "Go" and "No Go" plug gages for checking the bushing bores, and dial indicators piloted in the bushing bores for checking the concentricity of the valve seats.

Oil-Film Thickness Indicators for Sleeve Type Bearings

In studies of engines and engine lubricants, it is often desirable to measure clearances between shafts and sleeve or journal type bearings during operation. However, it is rather difficult to obtain such measurements without interrupting the operation, particularly when high speeds are being employed.

A method recently developed by the National Bureau of Standards appears to offer a satisfactory solution to the problem. The heart of the new system is a mutual-inductance type of electrical distance-measuring element; any change in the distance of the rotating shaft from two small fixed coils results in a readily measurable variation in the coupling between the coils.

Three successful models of this device have been developed. A cathode-ray tube is used with one to provide a continuous picture of shaft displacement, while the other models give distance indications on a dial or meter. Sensitivity is ample; a change in distance of as little as 10 micro-inches can be detected. In the cathode-ray tube model, a small change in the position of the shaft causes a displacement 150 times as great on the face of the cathode-ray tube, and this is by no means the maximum magnification attainable with the system.

A High-Strength Die Steel

By G. E. BRUMBACH, Metallurgist
The Carpenter Steel Co.
Reading, Pa.

COLD-HOBBING as a means of manufacturing dies, molds, and cavities for die-casting and plastic molding has been used successfully for many years. In fact, it is believed that this method of diemaking was first used in the year 1876 by Charles Burroughs, Sr., founder of the Burroughs Engineering Co. He found that, in order to produce molded parts in fairly large quantities, it was necessary to have multiple-cavity molds. Early experiments proved that steel cavities were best suited for this class of work. It was also learned that multiple cavities could be produced economically and uniformly by cold-hobbing.

Hobbing, as it is known today, has really undergone no basic changes. It is true that many improvements have been made in the equipment and technique, and shapes that were unheard of in the early days are now being hobbed daily without difficulty. However, this process has been largely confined in the past to very soft, ductile low-carbon or low-alloy steels, for obvious reasons. Because of the general characteristics and limitations in hardenability of these steels, they were lacking in core strength and resistance to heat. Diemakers had to choose between a steel that could be hobbed, but lacked high final properties, and a steel of good physical properties that could not be hobbed and thus entailed expensive machining.

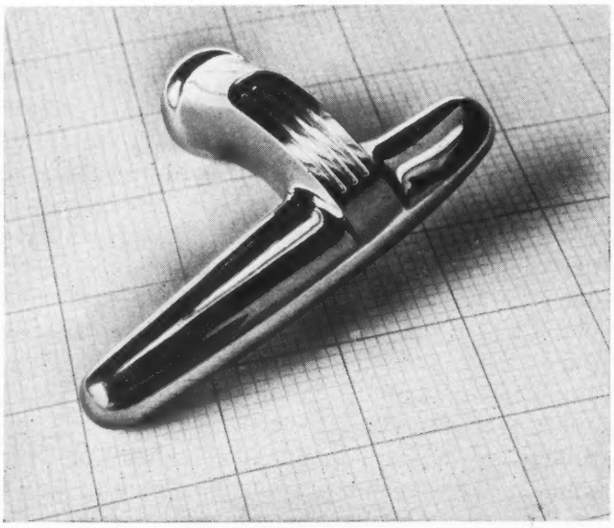


Fig. 1. Automotive emergency brake handle that is die-cast from a zinc alloy in a cavity that was cold-hobbed in one push

These restrictions made it particularly difficult for the hobbing process to be applied in the die-casting industry, where requirements have progressively increased in respect to closer tolerances, better surface finishes, and sounder castings. To meet these more rigid requirements, casting pressures and shot speeds have been increased. Under these conditions, low-carbon or low-alloy hobbing steels will not stand up for any appreciable length of time.

To overcome these restrictions, considerable time has been spent in developing a steel that would be capable of being cold-hobbed and, at the same time, would have the desired combination of high core strength and resistance to heat and abrasion. Several years of field testing on such a steel have now been completed. Much of the early experimental work on actual cavities was carried out at the Toledo plant of the Doehler-Jarvis Corporation. Also cooperating in the program was the Midland Die & Engraving Co., Chicago, Ill., as well as several other firms.

The results of this work provide tangible evidence (as indicated in the illustrations) that it is now practical to hob relatively large, as well as intricate, cavities in a high-strength alloy steel. This offers new opportunities to reduce the cost of diemaking.

This new steel, patented and known by the trade name of Super Samson, has the following composition: 0.10 per cent carbon, 0.30 per cent manganese, 0.25 per cent silicon, 5.00 per cent chromium, 0.90 per cent molybdenum, and 0.25 per cent vanadium. It is quite obvious that this analysis is relatively high in alloy content; yet it has a unique combination of properties. It can be annealed to a hardness of about 125 Brinell, and is therefore relatively easy to hob. It can be hardened by cooling in air or oil to a Brinell hardness of from 350 to 400 (37 to 42 Rockwell C) in large sections, and if the surface has been previously carburized, hardnesses of 60 to 63 Rockwell C are obtainable after the quench. These hardnesses are quite stable up to and including 1000 degrees F., and the high alloy content produces good resistance to abrasion.

This combination of properties is ideal for cavities used in die-casting zinc, aluminum, and magnesium, as well as molds for plastics requir-

that Can be Cold-Hobbed

ing temperatures up to and including 800 degrees F.

Appreciation of the advantages offered by the new steel can be obtained by comparing some of its basic properties and characteristics before and after heat-treatment with a number of well-known standard steels. Table 1 gives a comparison of the annealed hardness and hobbability of Super Samson and several other steels used for various types of cavities.

An examination of this data will indicate that the annealed hardness, in a certain sense, is a good criterion of the hobbability of the steels listed. In general, the depth of hobbing with constant pressure is proportional to the annealed hardness. However, additional studies made on the hobbability of steels indicate to some extent that the flow properties are also dependent on the rate of increase of hardness with cold-working, as well as hobbing speeds. The new steel has good hobbing properties, and its rate of work-hardening is somewhat lower than that of some of the other hobbing grade steels.

If we compare the mechanical properties of this steel with those of the conventional die steel containing 0.40 per cent carbon, 5 per cent chromium, 1.35 per cent molybdenum, and 1 per cent vanadium, we find that it has certain advantages. Some of the mechanical properties after testing at room temperature and at 800 degrees F. are shown in Table 2. The specific tempering temperatures of the specimens used in obtaining the data shown in this table were selected because they are quite generally used in actual practice.

An examination of these two tables reveals several desirable features of Super Samson steel. The elongation or ductility at room temperature and at 800 degrees F. is considerably higher in the new steel than in the conventional die steel. Also, its impact values are proportionally greater, indicating that it is not notch sensitive. It has generally been assumed that these two factors are a measure of resistance to heat checking and shock, and actual field tests have confirmed this theory in many cases.

When used for die-casting dies, the new steel is placed in service in the hardened and tempered condition, or after very light carburizing of the surface. As stated previously, steel of the basic analysis will harden to from 37 to 42 Rockwell C by air cooling or oil quenching. Dies are often used in this condition when casting zinc, or if long runs on aluminum or magnesium are not necessary. However, it has been learned that

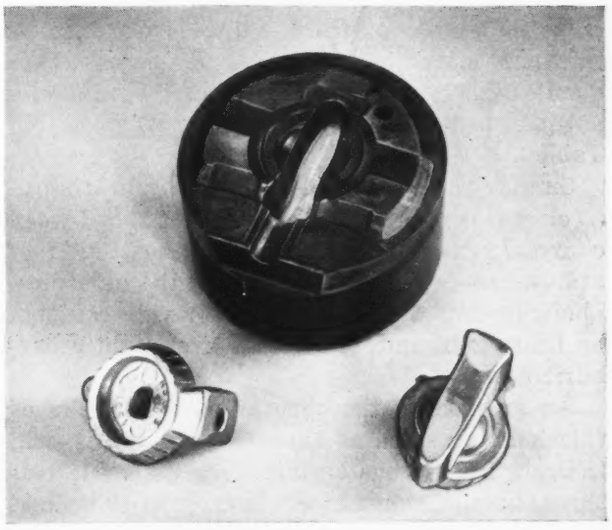


Fig. 2. More than 75,000 of the cast-aluminum washing machine parts shown at bottom of illustration have been produced in the single-impression die above

production can be increased measurably, and the dies will stand more abuse if the surfaces are lightly carburized. At this point, it may be well to elaborate on the term "lightly carburized."

Super Samson has a basic analysis of 0.10 per cent carbon, and it is quite understandable that the surface carbon of any die-casting die could be increased during heat-treatment to the extent of 0.20 to 0.30 per cent advantageously. It is also important to recognize the fact that this alloy has fairly large percentages of carbide forming elements, such as chromium, vanadium, and molybdenum—all of which promote carbon absorption. Therefore in any treatment aimed at securing a lightly carburized surface, this fact should be taken into account.

Table 1. Comparison of Annealed Hardness and Hobbability of Various Steels

Material	Hardness, Brinell (Annealed)	Depth Hobbed, Inch
0.10 per cent carbon, 0.10 per cent vanadium hobbing iron	85	0.82
0.10 per cent carbon, 2 per cent chromium mold steel	105	0.71
AISI 3110 steel.....	118	0.48
Super Samson	125	0.44
Type 420 stainless steel.....	165	0.10
AISI 3312 steel	196	0.08

The specimens used in obtaining the results tabulated were 1 3/4 inches in diameter by 2 1/4 inches long. Retaining ring was 1/2 inch off platen, with no blank relief. The hob employed was 0.910 inch in diameter, with taper of 0.045 inch per inch. Load applied—110 tons—one shot.

A light carburizing treatment can often be combined with pack-hardening as a means to prevent scaling during heat-treatment. One common method is to pack the part in cast gray-iron chips and soak for thirty minutes per inch of thickness at the hardening temperatures before quenching. Typical surface and core hardnesses, as quenched and after drawing, are given in Table 3.

Similar results can be obtained by heating in a closed container with sufficient hard-wood charcoal to react with the oxygen; heating in an atmosphere-controlled furnace with an atmosphere having a mild carbon-monoxide content; or heating in salt baths that are slightly carburizing.

An analysis of the general characteristics of this hobbing steel, as shown in the tables, will indicate that it has certain very desirable features, particularly for die-casting work. Most die-casting impressions are produced by machining to the approximate size and then finishing by a combination of hand-filing and polishing. All of this work is done by highly trained and skilled diemakers. This method of diemaking is naturally costly, and therefore anything that can be done to decrease die cost should be of interest to designers, production men, and sales engineers.

It is generally agreed that cold-hobbing has certain limitations, both economically and mechanically. However, if a number of impressions are anticipated, the application of hobbing immediately becomes a possibility.

For example, the emergency brake handle shown in Fig. 1 is a zinc die-casting that is required in large quantities. The cavity used in casting this part can be hobbed in one push, and when several dies are needed, can be made much more economically by cold-hobbing than by machining. Fig. 2 shows a part for a washing machine that is cast from aluminum and the single-impression die in which it is cast. At this writing, the cavities for casting this part and that shown in Fig. 1 have produced upward of 75,000 shots without any signs of deterioration.

There are many instances in which it is economical to machine part of the cavity and hob part of it. Fig. 3 shows a good example of this practice. The part illustrated is a gas-range burner cap, cast from an aluminum alloy. In the cavity for this casting, only the impressions for the teeth or serrations were cold-hobbed, the remainder of the cavity being machined. It proved to be far more economical to follow this practice than to machine the entire cavity. The parts shown in Figs. 1 to 3, inclusive, were made by the Rupert Diecasting Co., Kansas City, Mo.

The same principle—partial hobbing—can be considered in multiple-cavity work. Fig. 4 shows a single-shot zinc casting for a popular brand of toy cap pistol. Part of the cavity for producing this casting was machined, but most of the ornamental details were cold-hobbed. This example was supplied through the courtesy of the Summit-Roberts Tool Co., Toledo, Ohio. It represents a fairly good picture of what intricate details can be hobbed in the new steel.

Table 3. Surface and Core Hardness of Heat-Treated Super Samson Steel

Draw Temperature, Degrees F.	Hardness, Rockwell C	
	At Surface	At Core
(As quenched from carburizing temp.)	52 to 54	36 to 38
400	51 to 53	36 to 38
600	49 to 50	36 to 38
800	49 to 50	36 to 38
900	49 to 50	36 to 38
1000	48 to 49	36 to 38
1100	42 to 44	34 to 35

Steel carburized by packing in cast gray-iron chips and heating to a temperature of between 1725 and 1750 degrees F., holding at this temperature for thirty minutes per inch of thickness, and cooling in air.

Table 2. Mechanical Properties of Two Hobbing Steels

Mechanical Properties and Heat-Treatment	Super Samson		Die Steel Containing 0.40 Per Cent Carbon, 5 Per Cent Chromium, 1.35 Per Cent Molybdenum, 1 Per Cent Vanadium	
	At Room Temperature	At 800 Degrees F.	At Room Temperature	At 800 Degrees F.
Hardness, Brinell (as annealed)	125	—	220	—
Heat-Treatment				
Air-cooled from a temperature of	1750 Degrees F.		1850 Degrees F.	
Draw temperature	800 Degrees F.		1050 Degrees F.	
Tensile strength, pounds per square inch	187,000	183,400	235,000	231,000
Yield point, pounds per square inch	150,000	146,500	208,000	206,000
Elongation in 2 inches, per cent	15.8	19.4	10	11
Reduction of area, per cent	53.4	55.8	38	39.5
Charpy V-notch impact, foot-pounds	32	40	4.5	20.5
Hardness, Brinell	390	....	450	....

Fig. 3. (Top) The cavity in which this gas-range burner cap was cast was produced partly by machining and partly by cold-hobbing

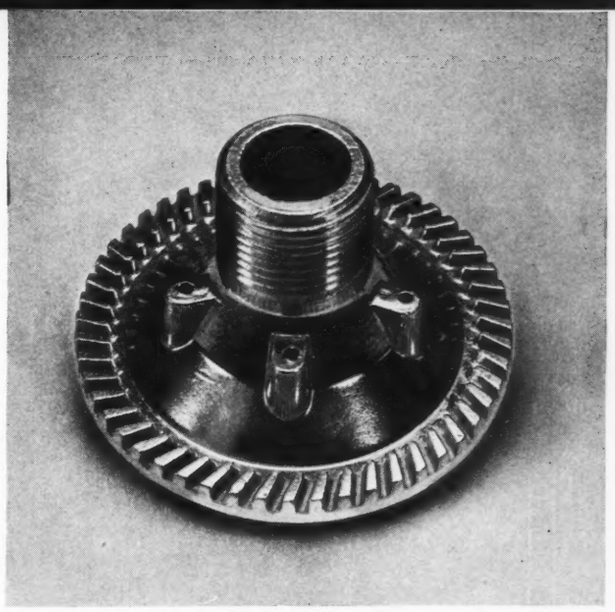
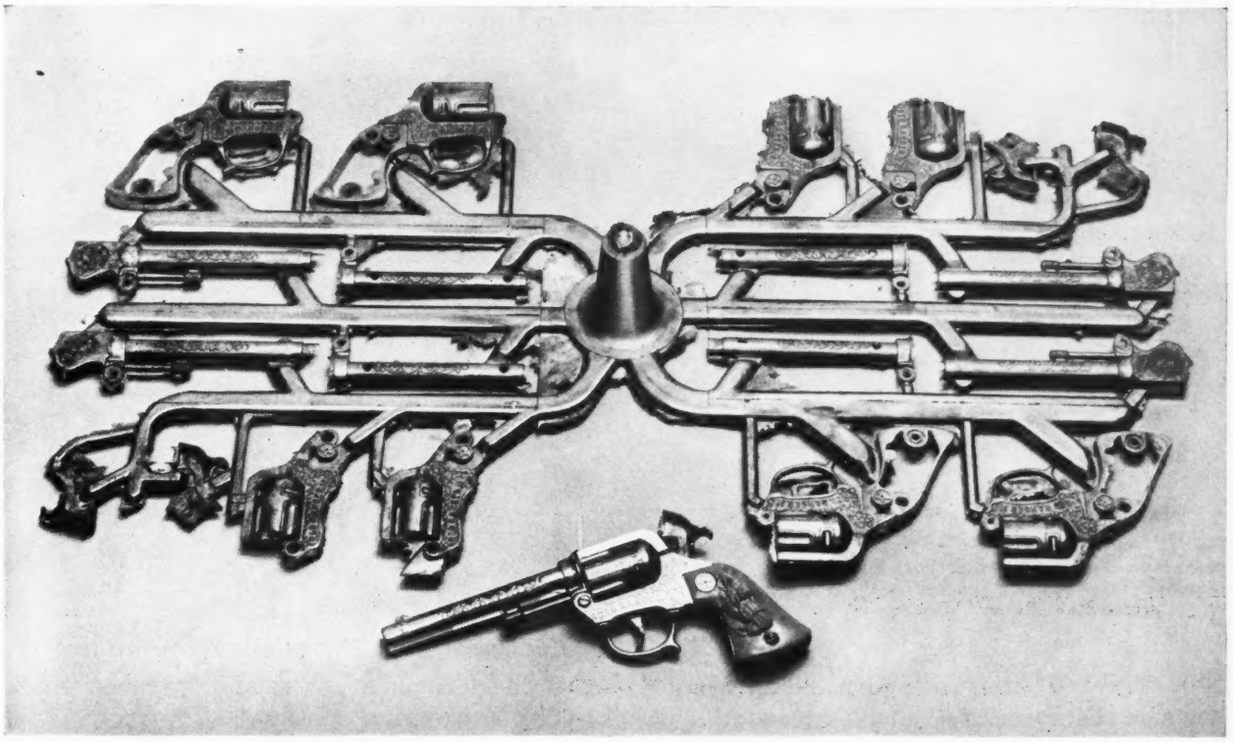
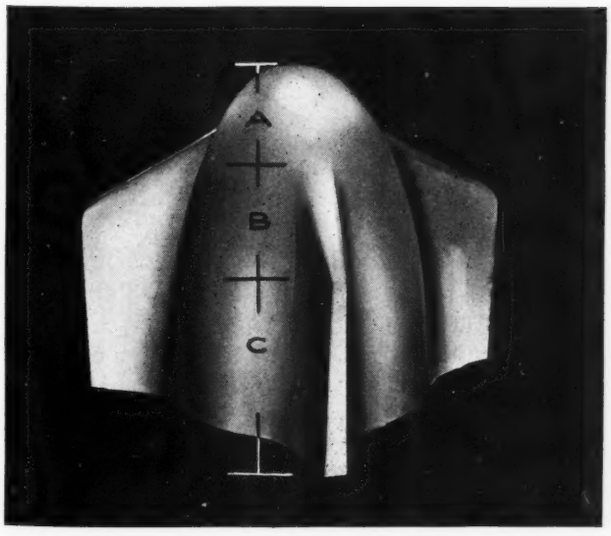


Fig. 4. (Middle) Zinc-alloy parts for four toy cap pistols are cast in a single shot in a multiple-cavity die. The ornamental details in the cavity were produced by cold-hobbing

Fig. 5. (Bottom) Large zinc-alloy automobile nose is die-cast in a cavity that was cold-hobbed under a pressure of 2800 tons in seven pushes





In considering hobbed impressions, one usually thinks of small dies or relatively shallow cavities. However, hobbing need no longer be confined to small dies if sufficient press capacity is available. For example, Fig. 5 shows a large zinc casting (produced by the Doehler-Jarvis Corporation) which can be recognized as the "spinner" nose on the 1950 Studebaker automobile.

In this case, the original forged block measured 16 by 16 by 9 1/2 inches. Seven pushes were required to sink the cavity, using an average pressure of 2800 tons. Distance *A* on the photograph represents the depth to which the cavity was sunk in the first push; *B*, the depth sunk in the next two pushes; and *C*, the depth sunk in the final four pushes. The blank was annealed at a temperature of between 1350 and

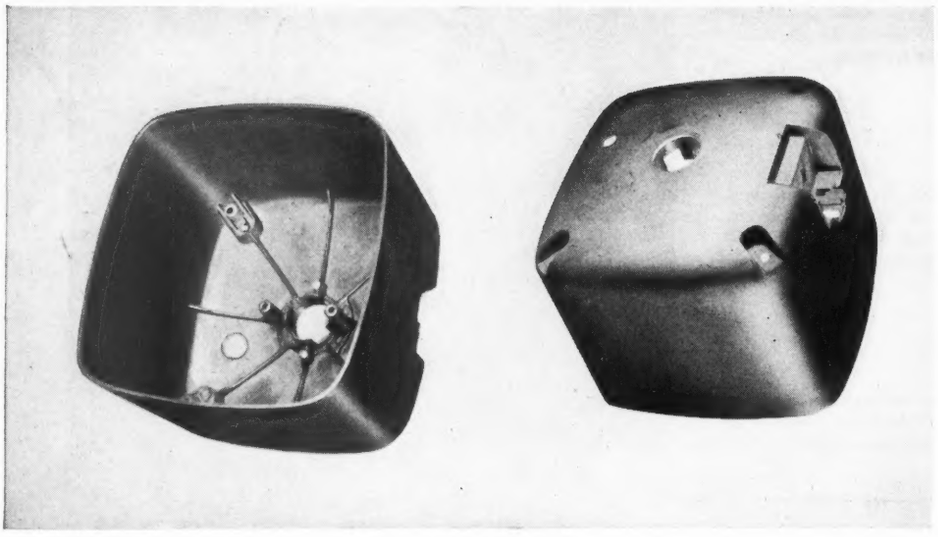


Fig. 6. One of the largest castings made in a hobbed cavity. The cavity is about 8 inches square by 5 inches deep

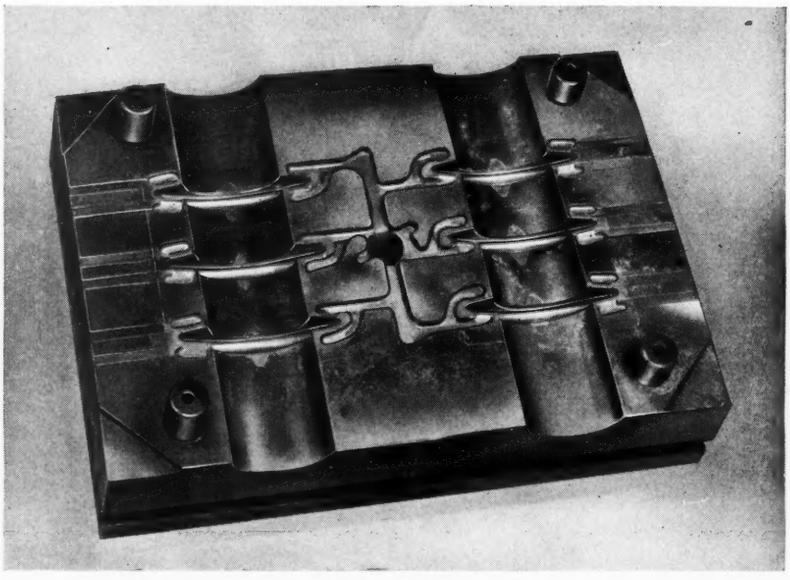


Fig. 7. Multiple-cavity die employed to cast zinc-alloy stove handles. Each cavity required four to five pushes with a pressure of 100 to 150 tons

1400 degrees F. after each push. Neither bottom nor side relief was used during hobbing.

One of the largest castings that has been produced in a hobbed cavity is shown in Fig. 6. The original forged blank measured 16 by 16 by 10 inches, and the finished cavity is approximately 8 inches square by 5 inches deep. About fourteen pushes were required to reach the necessary depth plus two pushes for closing. Bottom relief was used during hobbing, and the die was annealed after each push. This casting—a sweeper housing—was also made by the Doehler-Jarvis Corporation.

Fig. 7 is another good illustration of a multiple-cavity die. This die is used to cast zinc stove handles made by the American Cabinet Hardware Co., Rockford, Ill. Each cavity required four to five pushes, using a hobbing pressure of 100 to 150 tons per square inch. At this writing, the cavity had produced over 250,000 castings without any signs of wear. Based on past performance, it should produce about 1,000,000 castings.

In Figs. 8 and 9 are shown (at the left) the hobs used in producing the cavities (seen at the right) for casting two end-plates of an electric motor. Both hobs were made from Vega air-hardening tool steel, which is often used for these massive tools. While details on the number of pushes, heat-treatment, etc., are not available, these examples of casting dies give an excellent idea of what can be accomplished with the new hobbing steel.

Based on results up to the present time, it is believed that the new high-alloy hobbing steel will eventually have a permanent place in the group of die-casting steels. There are cases on record where cavities made from Super Samson have produced as many as 750,000 zinc-alloy castings, and 400,000 aluminum-alloy castings. In each case, the cavities were removed from service because of design change.

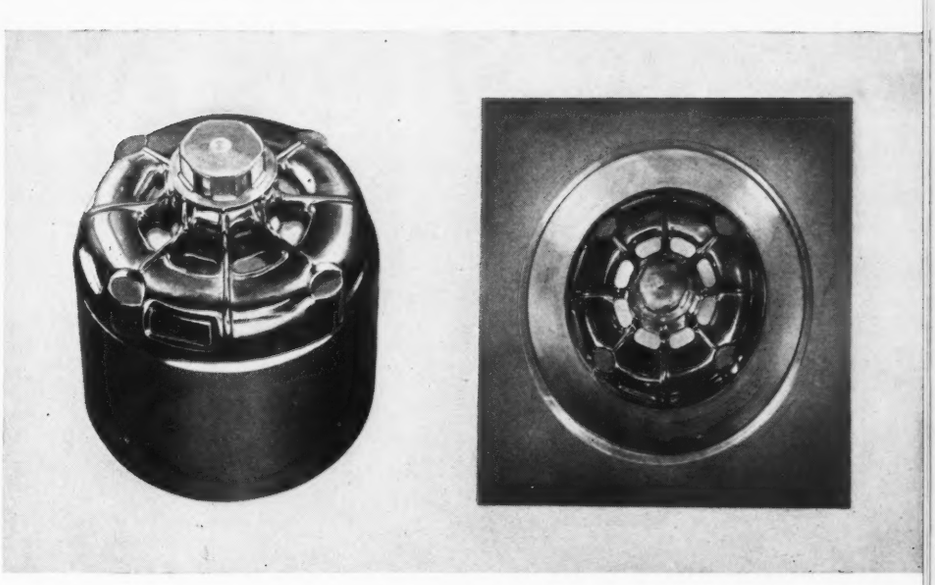


Fig. 8. Hob (left) made from air-hardening tool steel used in producing cavity (right) employed for casting an electrical motor end-plate

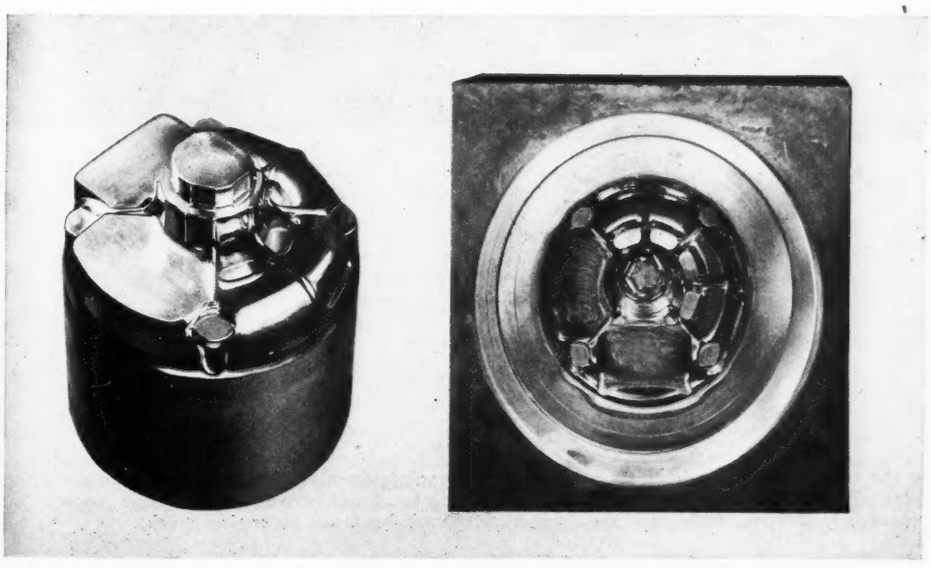


Fig. 9. Another hob (left) used in producing cavity (right) in high-strength steel for casting an electrical motor end-plate

Based on the present knowledge of this alloy, it is possible to predict that it will provide new opportunities for die economies on many jobs. The greatest savings will probably be found in hobbing versus machining of large or intricate cavities. It is also believed that the use of hobbed cavities will be extended, as the utilization of Super Samson steel will permit the casting of designs that are not practical to make in machined dies.

There is one other field of application for this steel that will bear further study. That is in the coining, pressing, or forging of metals, both hot and cold. Reports thus far show that at least two concerns have found this steel to be suitable for hot-forging dies in which the impressions have been cold-hobbed. It is still too early to make any definite predictions as to what can be accomplished along that line, but additional experimental work is being carried on, and the results look promising.

Machine Tool Industry Conference to be Held in Rockford

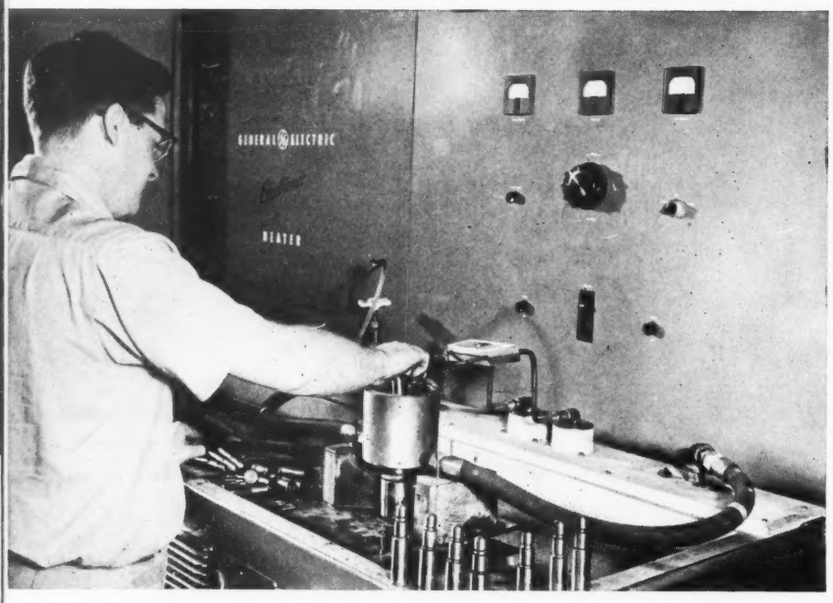
A three-day conference has been planned for engineers of builders and users of machine tools in Rockford, Ill., on November 14, 15, and 16. The hosts of this Machine Tool Industry Conference will be the Machine Tool Sub-committee of the Committee on General Industry Application of the American Institute of Electrical Engineers, and the Rock River Valley Section.

Eleven papers will be presented at three technical sessions, dealing principally with electrical design problems in machine tool building. One day will be devoted to visiting plants in Rockford and the surrounding area. More than 250 engineers attended last year's conference which was held at Worcester, Mass.

Further information can be obtained from B. T. Anderson, Sundstrand Machine Tool Co., Rockford, Ill., chairman of the conference.

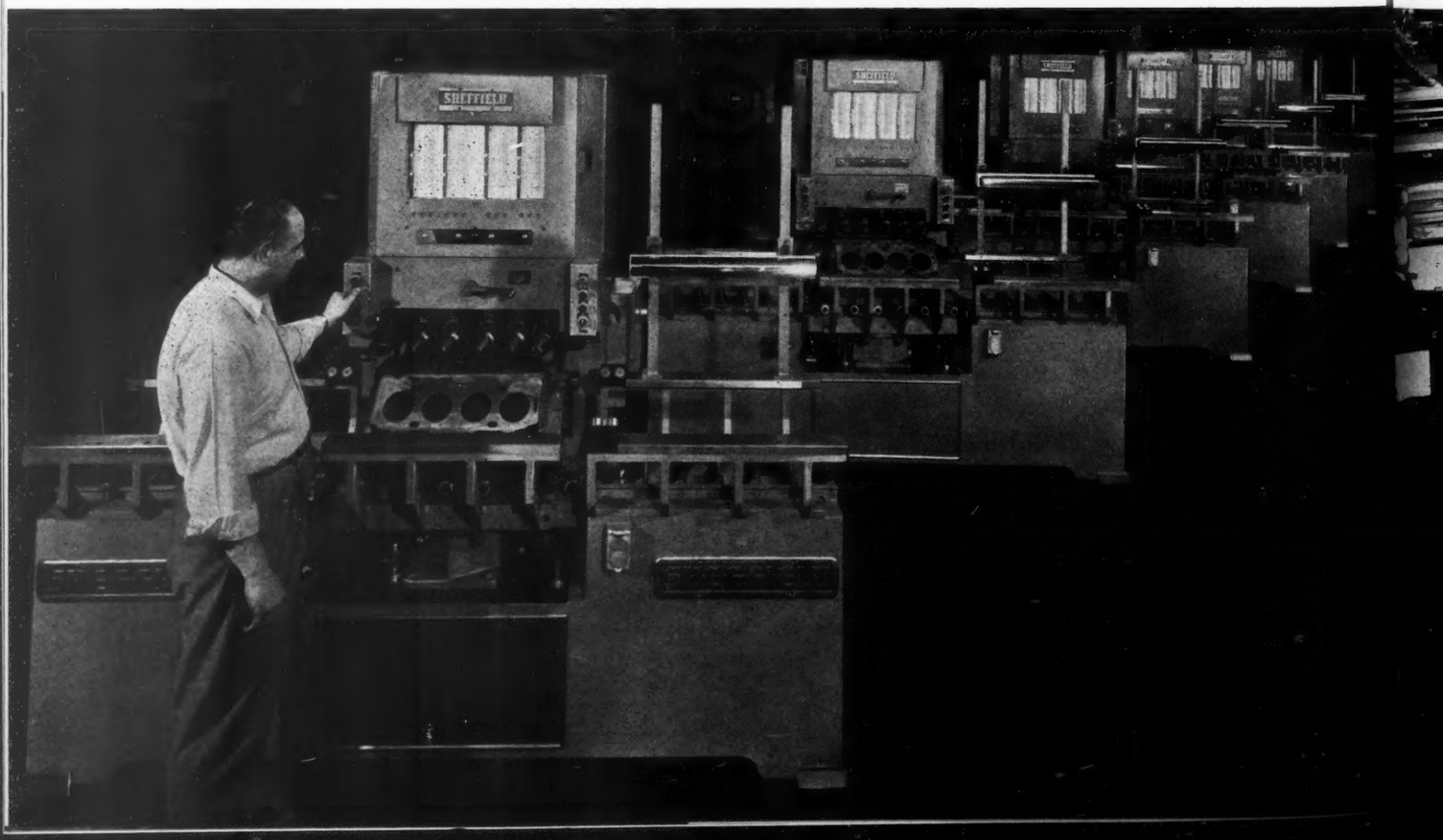
In Shops Around the Country

Camera Highlights of Some Interesting Operations Performed in Various Metal-Working Plants throughout the Nation

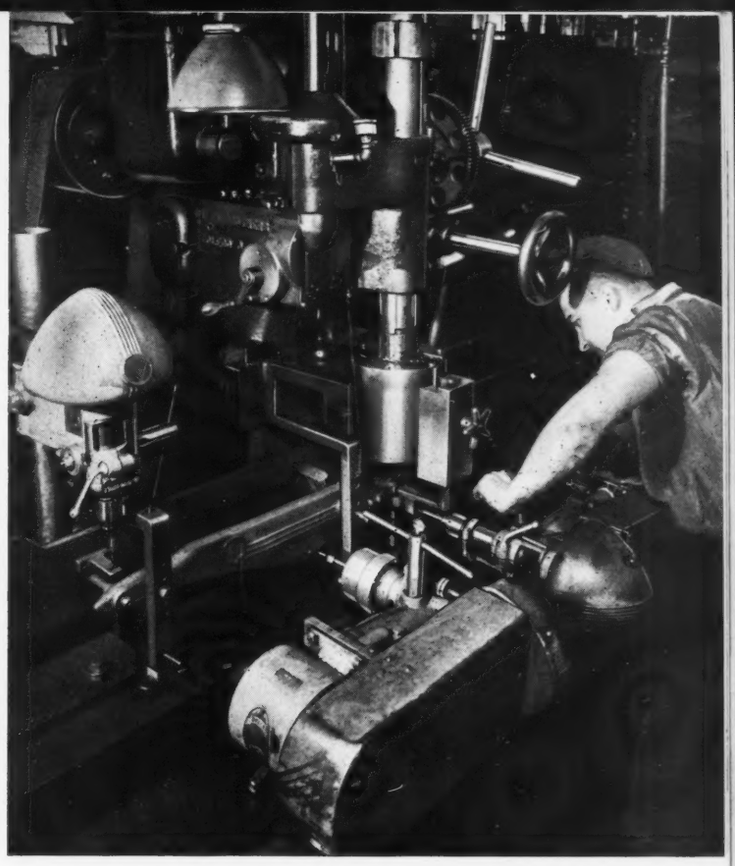


Costs of hardening coupling bolts have been cut 70 per cent at the DeLaval Steam Turbine Co., Trenton, N. J., by the use of the General Electric induction heater shown. Distortion-free hardening permits finish-machining the bolts prior to hardening

Automotive firms are leading the way for industry in the use of automatic gaging machines for the rapid, accurate inspection of critical dimensions. The six huge Precisionaire automatic gaging machines here illustrated were made by the Sheffield Corporation, Dayton, Ohio, for the inspection of cylinder bores in engine blocks



The time required to strip vinyl protective coatings from B-47 rear fuselage skins has been reduced by approximately 70 per cent by means of the tool seen above, which was developed by the Texas Engineering & Mfg. Co., Inc., Dallas, Tex. A liquid coating is dispensed by the bottle in just sufficient quantity to soften the edges of the area to be stripped. Immediately after the stripping operation, the liquid hardens and seals the remaining edges of the protective coating



Drilling production has been increased 300 per cent at the Blackhawk Mfg. Co., Milwaukee, Wis., by eliminating the need for a separate machine to do each of several drilling and tapping operations. The company devised a special set-up in which three Delta drilling units were mounted on one large drilling machine. The two horizontal heads (seen at the lower right) are supported on wheels. The third head (shown at the left) drills a vertical hole through the casting

Sheet metal is now stored vertically at the Pratt & Whitney Aircraft Division, United Aircraft Corporation, East Hartford, Conn., each kind in a separate "book" with steel-framed plywood covers. A lifting bar, slung from a monorail hoist, carries the "books" to the required machine. This "library" has reduced the man-hours required for handling by 90 per cent, and the necessary floor space has been cut in half

Machine Tool Distributors Meet in Atlantic City

THE American Machine Tool Distributors' Association held its twenty-seventh annual meeting at Haddon Hall, Atlantic City, N. J., Monday and Tuesday, October 1 and 2. After a business session, at which the opening remarks were made by the president of the Association, E. B. MacDonald, president of the Syracuse Supply Co., Syracuse, N. Y., and after the presentation of reports by the various standing committees, a general session was held at which three important papers were presented.

E. J. Seifreat of the Seifreat-Elstad Machinery Co., Dayton, Ohio, first made a report for the Government Relations Committee of the Association. This was followed by an address by Lieutenant General Orval R. Cook, Deputy Chief of Staff, Materiel, United States Air Force, Washington, D. C. He spoke on "The Air Force and Machine Tools," emphasizing the point that machine tools are an essential link in the chain of defense preparations, and indicating how the Air Force and the machine tool industry can cooperate to obtain the best results.

Tell Berna, general manager of the National Machine Tool Builders' Association, presented a report on the machine tool industry, in which he referred to the problems that have faced the industry because of the restrictions imposed on it, the efforts of the industry to overcome all obstacles, and the tremendous progress that has been made in producing machine tools during the present year.

Another session was devoted to the subject of selling. A. R. Eckberg, manager of engineering and maintenance, Kodak Park Works, Eastman Kodak Co., Rochester, N. Y., spoke on "The Customer's Viewpoint." He pointed out the importance of the salesman's contribution in the proper selection of machines and tools to meet the customer's requirements. Before recommending new equipment, the salesman should thoroughly study the customer's production problems and should be careful not to jump to conclusions. He should consider the future use of machines sold at the present time for defense production purposes, so that when a period of peace arrives, these machines may be turned to productive use in a peace-time industry.

Mr. Eckberg also emphasized that the salesman should not hesitate to recommend a competitor's machine if he believes that that machine would fit the customer's needs better than the one which he represents. Any salesman who will do this to the customer's advantage will build up confidence in his integrity and judgment, so that in the future, when he recommends his own machines, his word will not be questioned.

Richard S. Schultz, director, Industrial Relations Methods, Inc., New York City, spoke on "How to Appraise and Select Salesmen." He presented a logical and systematic method for hiring salesmen and outlined the different steps that should be taken in selecting the right man for the job. Mr. Schultz referred to essential questions to be answered in connection with the selection of salesmen, and presented an application rating sheet with sample questions that should be used when interviewing an applicant.

Frank Bettger of Philadelphia, Pa., presented an enthusiastically received address entitled "From Failure to Success in Selling." A successful seller of insurance himself, he spoke with a background of wide experience. The sum and substance of his address was that no matter what other qualifications a salesman may have, he will not succeed unless he has a great deal of enthusiasm. He must thoroughly believe in what he is selling, and his enthusiasm in this connection must be genuine, so that it will be convincing to the prospective customer.

The following officers were elected for the coming year: President, E. J. Seifreat, president, Seifreat-Elstad Machinery Co., Dayton, Ohio; vice-president, John M. Riordan, president, Riordan Machinery Co., Detroit, Mich.; second vice-president, E. R. Motch, Jr., president, Motch & Merryweather Machinery Co., Cleveland, Ohio; secretary-treasurer, G. B. McClennen, partner, Delta Equipment Co., Philadelphia, Pa.

To serve a three-year term on the executive committee, the following members were elected: Manus F. Campbell, president, Peninsular Machinery Co., Detroit, Mich.; J. D. Germain, owner and general manager, Eccles-Germain Machinery Co., Los Angeles, Calif.; and L. M. Wiertz, general manager, F. F. Barber Machinery Co., Toronto, Ontario, Canada. J. F. Owens, Jr., partner and general manager of the J. F. Owens Machinery Co., Syracuse, N. Y., was elected to fill the unexpired term on the executive committee of E. R. Motch, Jr., as Mr. Motch had been elected to serve as second vice-president.

Progressive Die with Dial Transfer Device

By EDWARD SLATTER
Senior Tool Engineer, Ansco Camera Plant
Binghamton, N. Y.

PRODUCTION of stampings for magazines designed to hold 35-millimeter film is an exacting job, since close fits must be maintained in assembling the stampings. This is essential to prevent the entry of light. Close fits, of course, entail accurate dimensions and necessitate precise dies. Yet, for economy, high production rates must be attained.

As Ansco is a large producer of films sold in magazines, its camera plant includes stamping facilities for making magazines in great quantities. Most of the dies required are constructed within this plant to designs developed by company engineers. One of the latest of these dies produces caps for a 35-millimeter magazine. These caps are assembled to the ends of a slotted spool from which the film feeds through the camera in which it is employed.

Caps for this small magazine are slightly under 1 inch in diameter, as seen on the part drawing, Fig. 1. Several dimensions of the cap must be held as close as ± 0.002 inch, and one dimension must be maintained to within ± 0.001 inch. These caps are made either from 31-gage (0.0105-inch thick) tempered tin plate or from tempered AISI C-1010 cold-rolled sheet steel, 0.010 inch thick. In both cases, coils 1 5/8 inches wide are used.

Because the cap is circular and requires rather severe working to produce the sinuous section, as seen in the enlarged sectional view *X–X*, it is desirable to "blister" or dome the stock in the first operation. A peripheral flange is then formed and the piece is sheared from the strip in the second operation. With the part severed from the strip, it is necessary to transfer it successively to other stations, where the remaining operations can be done, and, of course, to position it precisely at each of these stations. This was accomplished by the use of a dial.

The die, including the dial, is shown in the drawing, Fig. 2, and, set up in a press in Fig. 3. The dial is a brass plate that serves only for transfer and positioning functions. After being cut from the stock, the work-pieces are pressed immediately into the dial holes, and are held on their periphery during all of the subsequent operations. Thus, the dial does not constitute or contain portions of the die, but holds and locates the work until all of the forming is completed.

As Fig. 2 indicates, there are two straight-line stations in the die (see section *F–F*) and five other working stations, including the one at which ejection takes place. These latter five stations are seen in sections *A–A*, *B–B*, *C–C*, *D–D*, and *E–E*.

Around the center of the dial are eighteen bushings having their centers on the same radial lines as the centers of the eighteen holes that advance the work. A ball (section *L–L*), pressed upward by a spring, moves into each bushing as the dial is indexed and keeps the dial

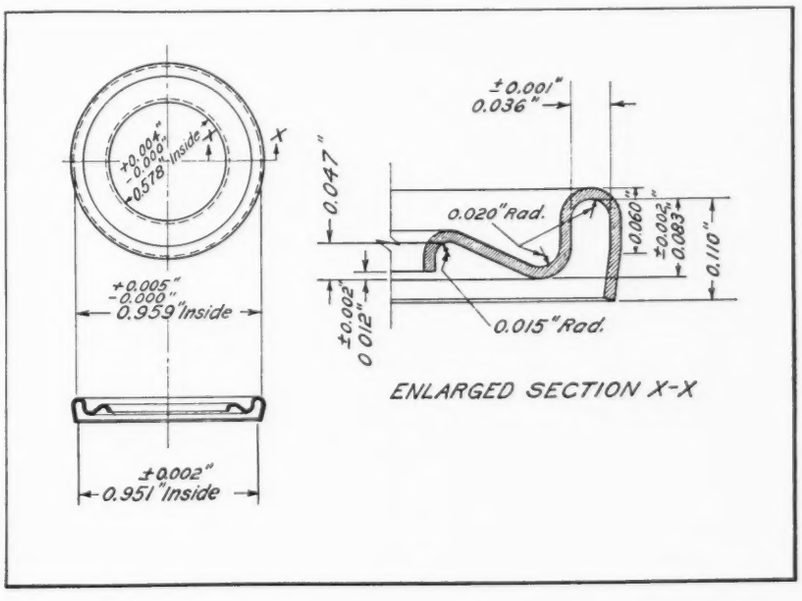


Fig. 1. Detail drawing of the cap for a 35 millimeter cylindrical film magazine produced in the Ansco camera plant. Several dimensions of the cap must be held to unusually close limits

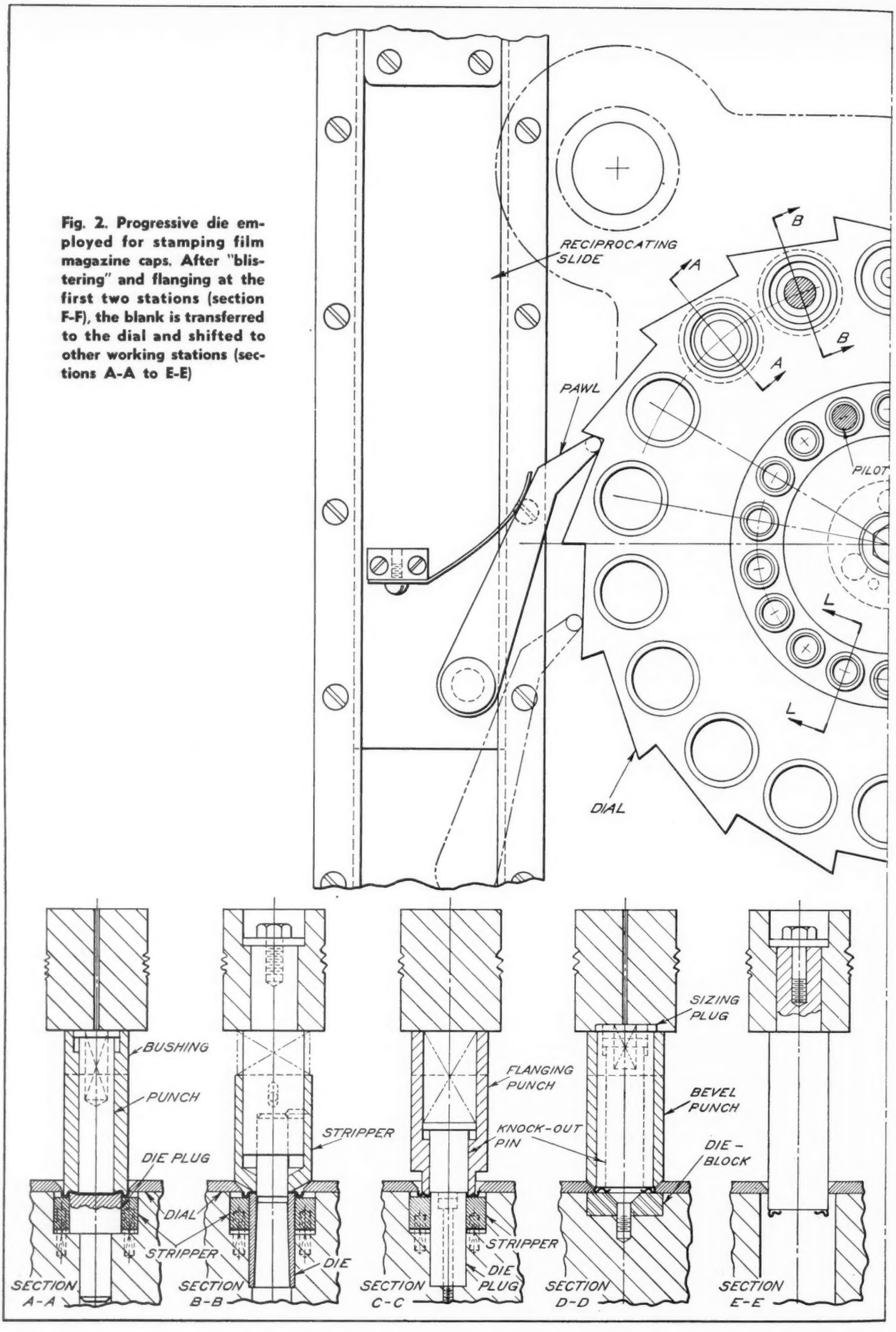
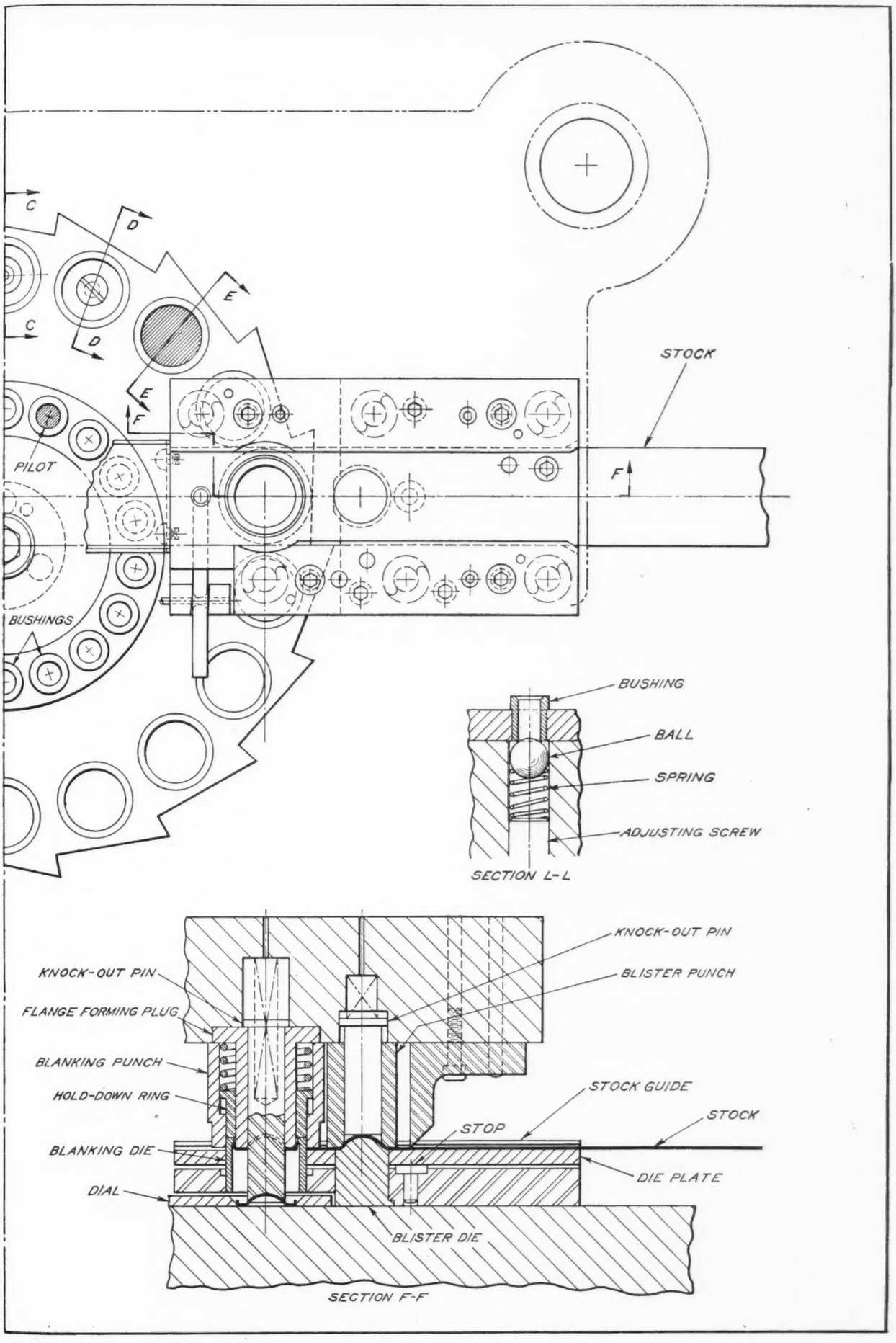


Fig. 2. Progressive die employed for stamping film magazine caps. After "blistering" and flanging at the first two stations (section F-F), the blank is transferred to the dial and shifted to other working stations (sections A-A to E-E)


C
D
E
F
STOCK
PILOT
BUSHINGS
BUSHING
BALL
SPRING
ADJUSTING SCREW
SECTION L-L
KNOCK-OUT PIN
FLANGE FORMING PLUG
BLANKING PUNCH
HOLD-DOWN RING
BLANKING DIE
DIAL
BLISTER PUNCH
STOCK GUIDE
STOP
DIE PLATE
BLISTER DIE
SECTION F-F

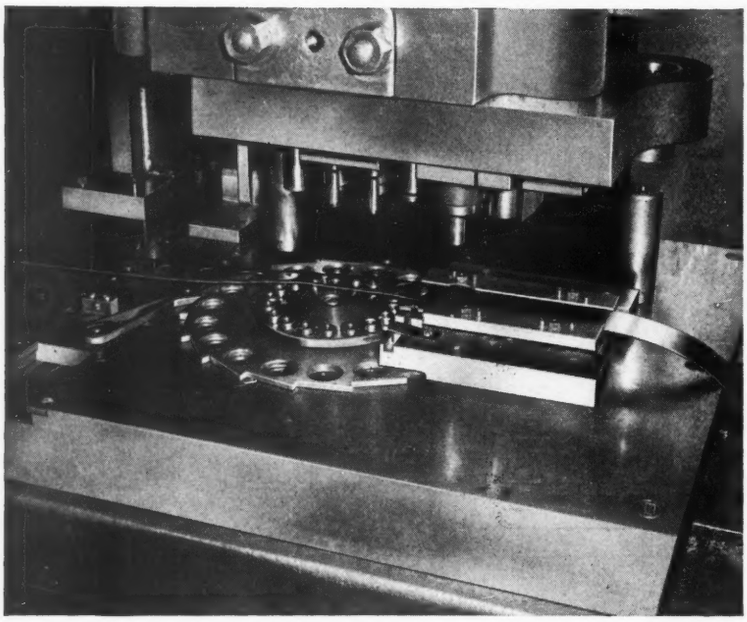


Fig. 3. Progressive die set up on press, showing dial for shifting the partially formed blanks from the second straight-line station to the remaining working stations at the back of the dial. The dial is indexed by means of a pawl and ratchet

from overrunning by inertia when indexed. Positive locating of the dial is accomplished by two round-end pilots attached to the upper die or punch. These pilots enter two of the bushings at each working stroke.

Indexing of the dial, which has ratchet teeth on its periphery, is effected by a pawl mounted on a reciprocating slide. The slide is operated by a bellcrank, which is rocked by a rod from the crankshaft of the press. In this case, a No. 21 1/2 Bliss press having a 3-inch stroke is used. Stock from a reel is fed through straightening rolls intermittently, being advanced 1.562 inches with each stroke of the press.

At the first work station, seen at the right in section *F–F*, a blister is formed upward on the strip. When the stock is again indexed, the blister on the strip is centered at the second station (left in section *F–F*). There a circle of metal that includes the blister is blanked, and a flange is turned up around its periphery. The formed blank is immediately pushed downward into the dial hole that is directly under this station. The blank is a light press fit in the hole. A spring-loaded die plate, on which the stock guides are mounted, raises the strip stock to the top level of the blister and blanking dies.

On the upward stroke of the die, the strip is again advanced, while the scrap continues along above the dial, and the next blister is carried to the second station. The partially formed blanks pushed into the dial are advanced through eleven stations before any further work is done on them. At the twelfth station (section *A–A*), a flat-ended punch strikes the work-piece against a plug die, and metal is forced into a circular groove in the end of the bushing that surrounds the punch, giving the work the form shown. In this, as in subsequent dial stations, the formed part is lifted back into its position in the dial hole on the up stroke of the press ram by spring-loaded stripper rings. This arrangement keeps the dial and work free from the dies when indexing occurs.

At the thirteenth station (section *B–B*), a punch pierces a hole at the center of the work, and the slug falls through the die. Then the part is transferred to the fourteenth station (section *C–C*), where a flange is formed downward around the hole just pierced. After the work has been indexed to the fifteenth station (section *D–D*), the final shaping is done by forming a bevel on the periphery of the cap and pressing down on the center of the sinuous section to obtain the desired dimensions. A three-piece punch consisting of a bevel punch, a sizing plug, and a knock-out pin is employed for this operation, which is performed while the work-piece rests on a flat die block and remains in the dial hole.

When advanced to the sixteenth station, a punch that just clears the dial hole pushes the finished cap out of the hole, permitting it to fall through the die into a tote box. The seventeenth station on the dial is idle, and, at the eighteenth station, the dial hole is reloaded with a newly formed blank and the cycle repeats itself.

With this die, which operates automatically, about 3500 caps are produced per hour, a completed part falling from the die with each stroke of the press ram. At the same time, the caps are held within the remarkably close limits set.

* * *

In 1900, the average industrial worker had 2 H.P. to help him turn out goods; by 1939 he had 6.

How Changes in Gear-Cutting Practice Increased Efficiency

By RAY MAXWELL, Superintendent
Gear Division, International Harvester Co.
Milwaukee Works

AN important spot in the production picture of any plant building complex agricultural equipment is the gear department. Gears are key elements in all such equipment, and although quality must be given first consideration in making gears, cost and output are also important factors. At the International Harvester Co.'s Milwaukee Works it has been found possible to raise quality, reduce costs, and step up output at the same time by the proper selection of gear processing methods.

The method of producing a cast-iron timing gear for a tractor engine represents a typical example of how a change in processing improved both quality and output, while reducing costs. This 10-pitch, fifty-four-tooth helical gear, seen at the lower left in Fig. 1, has an outside diameter of 5 1/2 inches, a 1 1/4-inch face width, and a helix angle of 39 degrees. It was formerly produced by hobbing with a single-thread hob. Fairly light feeds were used to obtain the required finish and accuracy. The output (three gears per hour per machine) was not high with this method, and a considerable number of machines were needed to meet production demands.

To increase the output, it was decided to split up the job by using hobbing only for pre-cutting and finishing the gear by shaving. This made it possible to use a triple-thread hob, with heavier feeds. The operation is performed on a Gould & Eberhardt hobbing machine, as seen in Fig. 2, and the output is eight gears per hour per machine.

The rougher finish produced by the triple-thread hob and the heavier feeds employed presented no problem, since the gears were afterward shaved on a Michigan Tool Co.'s shaving machine. In fact, gears produced in this way have greater accuracy and better finish than those previously obtained, and are therefore quieter in operation. Also, a study of cost figures showed that the original hobbing operation cost 36 per cent more than the combined hobbing and shaving method.

It is believed that even better production can be obtained in this operation. Cutters have been

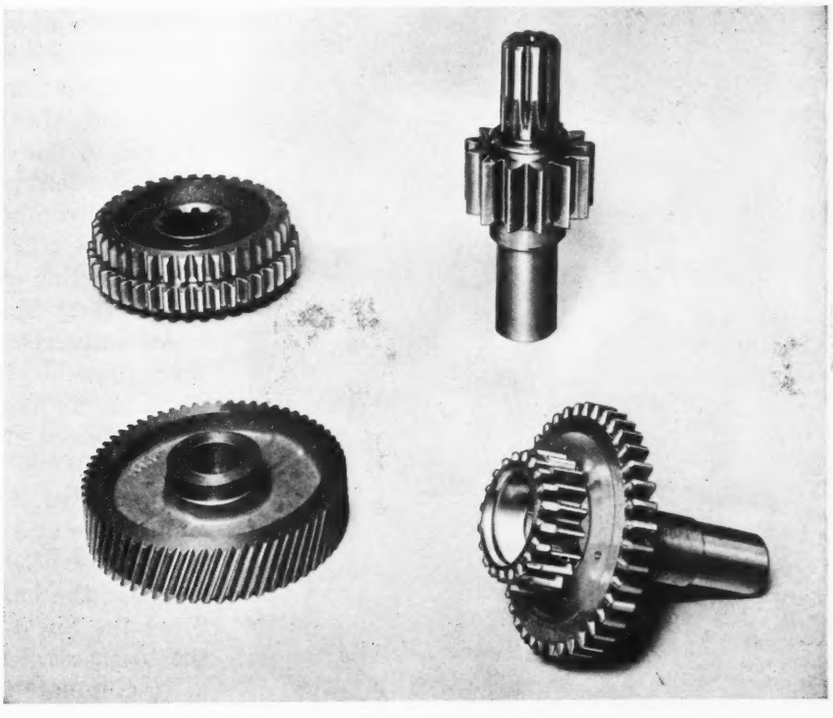


Fig. 1. Production has been increased and costs reduced in manufacturing tractor gears by a change in processing. The teeth in the gear at the upper right are both tapered and crowned (see Fig. 5) by "underpass" shaving with reverse-crowned cutters. Precision tolerances are maintained on the transmission gear shown at the lower right

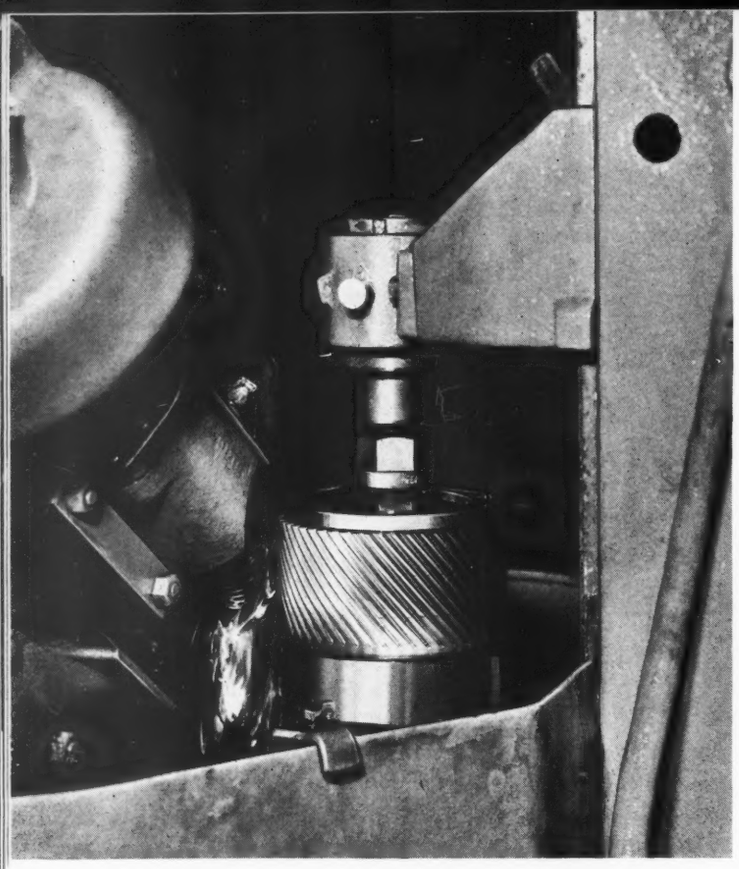


Fig. 2. Close-up view of the triple-thread hobbing operation performed on the gear seen at the lower left in Fig. 1. About 0.002 inch of stock is left on each tooth face for removal in a subsequent shaving operation

Fig. 3. All the teeth on one end of the gear shown at the upper left in Fig. 1 are cut at once by means of radially fed cutters on this machine. A similar machine is used to cut the teeth on the other end of the gear

ordered to permit shaving this gear by the "underpass" method. This will nearly double the rate of output in the shaving operation without requiring any changes in the existing machines. This is not an isolated example. In most cases, we have found that it takes less time to obtain the required finish and accuracy by combining hobbing with shaving than by hobbing alone.

Two Machines Replace Nine in Cutting Teeth on Double Gears

Another gear production process that has accomplished a revolution in output and still kept quality at a top level combines a pre-cutting gear-shaping operation with finish-shaving. The gear-shaping operation is done on a Shear-Speed gear shaper made by the Michigan Tool Co. (Fig. 3). In this operation, all the teeth of a gear are cut simultaneously through radial infeed of the cutter blades while the work reciprocates. On the first and second speed sliding gear for an International Harvester tractor transmission, for instance, this method has reduced production time to about one-tenth of that formerly required.

One end of this double gear (seen at the upper left in Fig. 1) is 6-pitch, and has twenty-nine teeth; the other end is 6-pitch and has thirty teeth. With the former set-up, the teeth were roughed on one machine and finished on another. This method gave a production of only two gears per hour, and nine machines were required. In addition, the gears had to be shaved after cutting the teeth, in order to obtain the desired finish and accuracy.

With the new method, one end of each gear is shaped on one machine. The gear then goes to a second machine which shapes the teeth on the other end. Both of the gear-shaping machines are run by one operator.

The current production is 21.7 complete gears per hour, compared to the two gears per hour previously obtained. The subsequent "underpass" shaving operation is accomplished at the rate of forty-nine gears per hour.

An interesting simplification in tooling was made possible by the use of the Shear-Speed machine. It was found that the usual protuberance required on pre-finishing cutters when the gears had to be shaved to a smooth flank could be eliminated. Such pre-finishing cutters have a small bulge at each side of the tip on each tooth, the purpose of which is to provide a slight undercut near the base of the tooth being machined. Since the Shear-Speed tools are shaper cutters, the tooth can be so formed during pre-shaving as to eliminate the usual under-cut.

Blades on the Shear-Speed machines are changed after every 225 gears. Although the blades would still cut satisfactory gears, it has been found desirable to change the blades before they become dull. This gives greater tool life, since less stock is removed in sharpening. After removal from the machine, the set of blades is taken to the grinding room and about 0.020 inch is ground from each blade. This practice permits about thirty-five grinds per set of blades. Three sets of blades are kept on hand for each machine. While one set is being used, another set is being reground, and the third set (previously prepared for use) is ready for installation. Change-over time for a set of blades is only thirty to forty minutes.

Other steps in the production of this double transmission gear are as follows: After rough-drilling and broaching the spline in the forging, which is made of S A E 8620 steel, the blanks are rough-turned, two at a time, on Fay automatic lathes. Then they are faced on Heald precision boring machines, and the shifter groove is cut, locating the work from the previously machined spline and face. Next the gears go to the Shear-Speed machines for pre-cutting the teeth, following which the teeth are rounded on Cimatool machines. Finally, the gears are shaved.

Shaving and Crowning Methods

In this plant, about 80 per cent of all gears are shaved—most of them by the "underpass" method. Crowning of gear teeth is avoided wherever possible, in order to retain maximum effective tooth contact in service. However, when crowning is necessary (this is the case for about 30 per cent of the shaved gears) reverse-crowned cutters are employed, since they save a set-up operation and are extremely accurate. Also, their use permits freedom in selecting the type of tooth relief best fitted for an application.

An interesting case of a gear whose teeth are crown-shaved to relieve them is the bull pinion seen at the upper right in Fig. 1. When these gears come off the shaving machine, their teeth are both tapered and crowned. This not only provides end relief, but also takes care of a shaft deflection problem under the 20-ton load that this gear sometimes carries in service.

The bull pinion, which is 4-pitch and has thirteen teeth with a face width of 2 1/4 inches, is roughed with a double-thread hob, and then semi-finished with a single-thread hob, which includes the 0.008-inch taper. Finish-shaving is performed on the Michigan machine shown in Fig. 4. The "underpass" method is used, with a 2 1/2-inch wide, reverse-crowned cutter, and the teeth are crowned from 0.0003 to 0.0005 inch per inch of tooth width, with the high point of the crown located in the center of the tooth, as seen in Fig. 5.

When this gear is under load, the contact is distributed over nearly 100 per cent of the face width. If a plain crown were used without taper, the amount of crown would have to be quite large to avoid end loading between the pinion teeth and the teeth of the gear with which it mates. As a result, the effective face width for normal service would be very greatly reduced, thus weakening the gear. As in this case, careful consideration is given to the particular application difficulties of each gear before specifying any of the types of crown or tooth relief.

Accuracy Maintained in Manufacturing Gears for Agricultural Equipment

An idea of the accuracy required in manufacturing gears for agricultural equipment can be obtained by considering the example seen at the

Fig. 4. Set-up employed to shave the gear seen at the upper right in Fig. 1. Even cutter wear is obtained while maintaining correct reverse-crown by using a 2½-inch wide cutter on this 2¼-inch wide gear

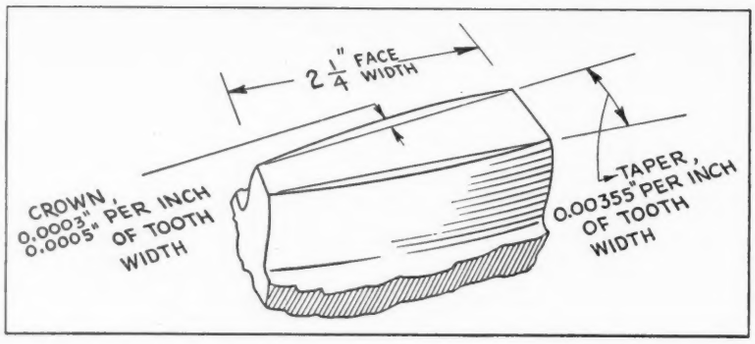


Fig. 5. Sketch showing (exaggerated) the taper and crown obtained on gear teeth in "underpass" shaving with reverse-crowned cutters to take care of shaft deflection under heavy loads

lower right in Fig. 1. This transmission driving gear would be extremely difficult, if not impossible, to produce on a quantity basis within the critical quality standards specified if shaving were not employed.

The small gear is 7.0476-pitch and has twenty teeth, while the large gear is 7-pitch and has thirty-nine teeth. Lead must be maintained within a tolerance of 0.0002 inch per inch of tooth width; accumulated tooth spacing error must not exceed 0.0006 inch; and the pitch diameter tolerance must be held to 0.002 inch. The small gear is both rough- and finish-shaped, after which the large gear is hobbed. Then both gears are shaved by the "underpass" method with reverse-crowned cutters. The production per hour is thirty-seven complete gears.

Despite the close tolerances required, the life of the shaving cutters used in this operation is long. It is standard practice to change cutters after 10,000 gears have been shaved. The cutters are shipped back to the Michigan Tool Co. for resharpening. Each cutter can be reground five or six times, on an average.

* * *

Collapsible Drums for Shipping Liquids Reduce Cost of Returning "Empties"

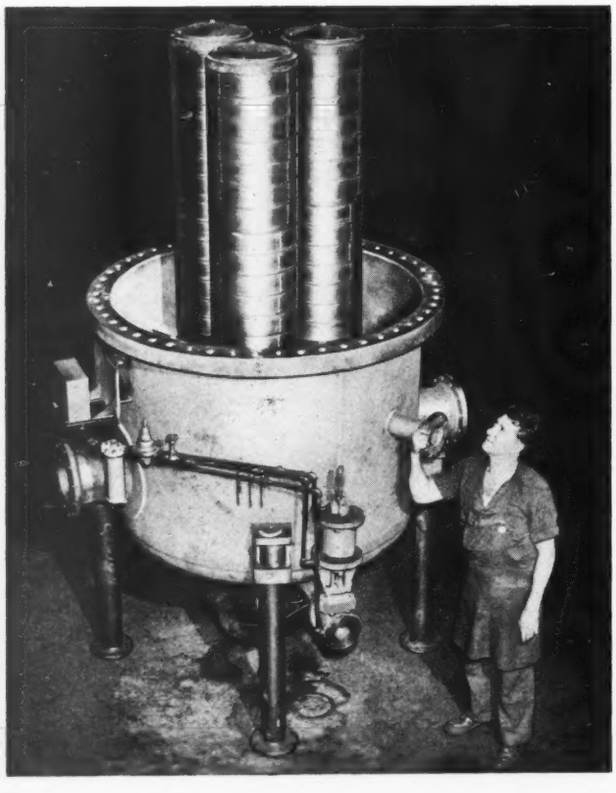
A 55-gallon synthetic-rubber drum for shipping liquids, which can be collapsed after emptying and returned for reuse, has been developed by the U. S. Rubber Co. Limited quantities of these drums are already being produced for essential use in the petroleum and liquid chemical fields. They effect sizable savings in return shipping costs, since more than 2500 collapsed drums can be shipped in a standard railroad box car that would hold only 300 rigid drums. The new synthetic-rubber drums are equipped with simple, yet effective, fittings for filling, emptying, lifting, and handling, and are non-corrosive, non-absorbent and resistant to weather conditions.

* * *

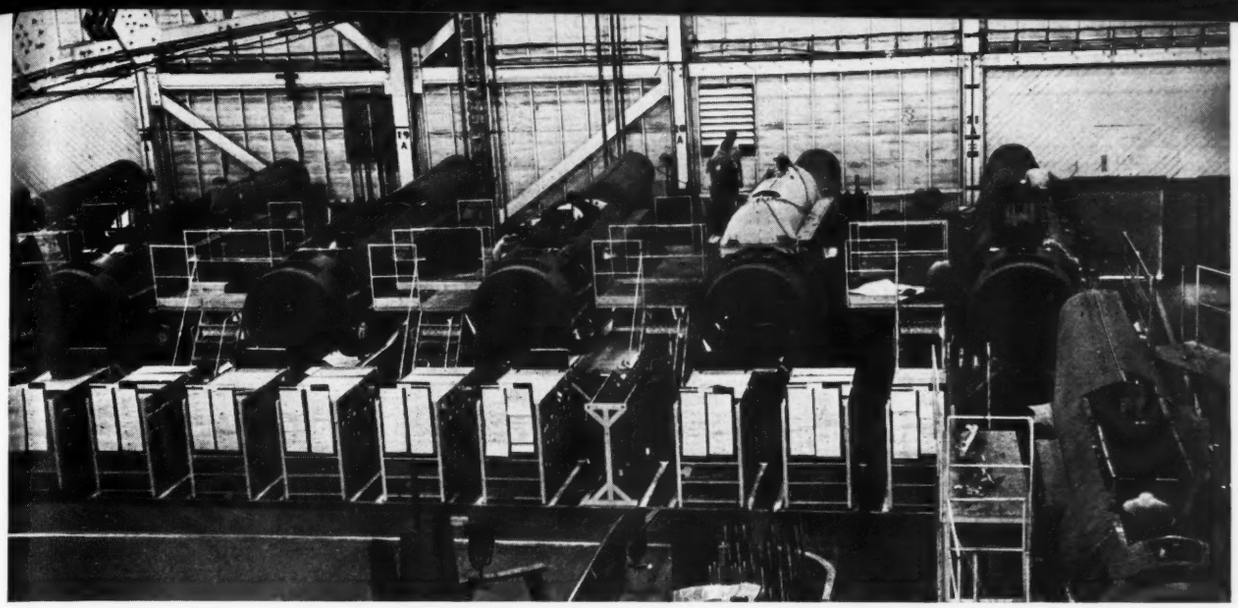
Giant-Size Fluid Strainer for New Automotive Engine Plant

The production equipment for a new automotive engine plant will include a giant-size "Flo-Klean" strainer built by the Cuno Engineering Corporation, Meriden, Conn. This strainer, shown without its "bonnet" in the accompanying illustration, has a rated capacity of 15,000 gallons of fluid per minute, and is the largest of its type ever built.

It is designed to strain the fluid through multiple wire cages which are kept clean by continuously backwashing with the fluid returned to the strainer. The strainer is equipped with automatic sludge blow-downs, and will operate continuously with a minimum of maintenance.



Huge strainer, with capacity of 15,000 gallons of fluid per minute, developed for installation in an automotive engine plant



Open-Bin Stocking of Parts Speeds Aircraft Assembly

By GILBERT C. CLOSE

STOCKING of all parts and sub-assemblies in open bins and racks along the production line, as seen in Fig. 1, has spurred production of the U. S. Air Force's F-89 Scorpion "all-weather" interceptor airplanes at Northrop Aircraft, Inc., Hawthorne, Calif. This system, although in use for only six months, has already resulted in substantial economies.

The new system of parts stocking was based on the idea that if a production man has to take more than a single step to procure the part he needs, he is walking too far. It was originally labeled a "one-step" stocking plan. While it was impossible to adhere to this standard of efficiency, it was a goal toward which to work, and results have proved the efficacy of the idea.

In putting the plan into operation, racks and bins were installed along the final assembly line, in the major component assembly departments (Fig. 2), and in the sub-assembly departments. These were located as close as possible to the point where the parts they contained would be

Fig. 1. (Above) Fuselage assembly line for the Northrop F-89 Scorpion. Parts required for installation here are stocked in racks in front of each body section

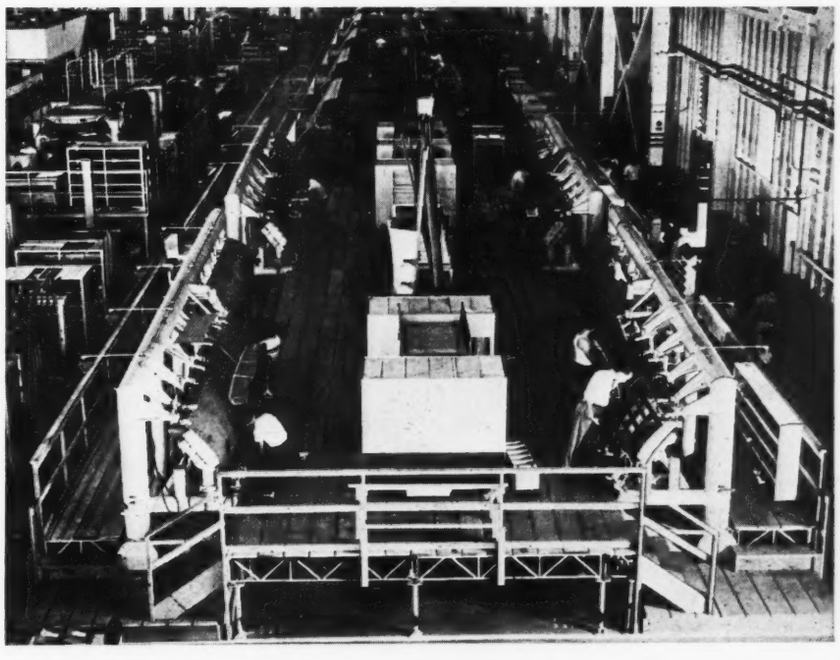


Fig. 2. Aircraft body sections are built in semicircular shape for greater production efficiency. Bins and racks containing parts for these sections are placed adjacent to the workmen

used. It was discovered immediately that, in most cases, racks and bins could be placed in what otherwise would be "lost space" around the jigs and assembly stations. Additional plant floor space was saved by the elimination of numerous stock-rooms. Thus space-saving proved to be an important by-product of the new system.

With this system, fabricated parts are routed directly to sub-assembly departments and placed in their respective bins near the spot where they will be used, as seen in Fig. 3. Similarly, sub-assemblies are routed directly to the assembly line. Purchased parts and government-furnished equipment travel directly from the receiving warehouse to the station where they will be incorporated in the airplane. Standard bins and racks are used in most cases, but special racks were constructed for line storage of easily damaged parts and odd-shaped parts, such as skins, panels, ducts, contoured sections, and formed hydraulic tubing.

The keeping of records is reduced to a minimum with this system. Stock sheets, one for each type of part, are posted at the end of the bin or rack (Fig. 4). These sheets are ruled in squares, each of which represents a part. When a material control man places parts in the bin, he draws a diagonal line through one square for each part. Subsequently, when a workman on the assembly line withdraws a part for use, he crosses this first diagonal with a second. Thus the number of parts that have been withdrawn are indicated by an X, and the number of parts remaining in the bin are indicated by a single diagonal line.

In effect, this procedure is analogous to keeping a perpetual inventory of each stock item. A single glance at the stock sheet indicates the number of parts still on hand. Occasional checks by material control personnel are made to insure that the parts lists correspond with the actual number of parts in the bin.

This system has proved highly advantageous in reducing bottleneck shortages. Every effort is made to retain a "cushion" of parts in each bin, over and above normal production requirements. When it becomes necessary to break into this "cushion" of reserves, the material control department can immediately instigate measures for replacement. If the shortage promises to become critical and is not caused by a temporary delay in fabrication, the problem is put in the hands of a special expediter, who devotes his entire efforts to rectifying the situation.

In the few cases where an unexpected surge in fabrication of sub-assembly work created an over-stock of parts or sub-assemblies, these parts were held temporarily in a centralized dispersal area until they could be removed and stocked at their regular production-line location.

From the very first, the production-line stocking system has resulted in a considerable saving of material-service man-hours. Repetitious and non-productive stock-room receiving, storing, dispersing, and record-keeping were dispensed with immediately. Then, as experience was gained with the new system, fewer and fewer material control personnel were required for restocking and checking the bins and racks along the production line. First-hand acquaintance with production requirements, along with visual and recorded evidence of the number of parts

Fig. 3. Components travel directly from fabrication shops to this cockpit floor assembly fixture, and are stocked neatly in open bins. Skin sections are stacked on edge

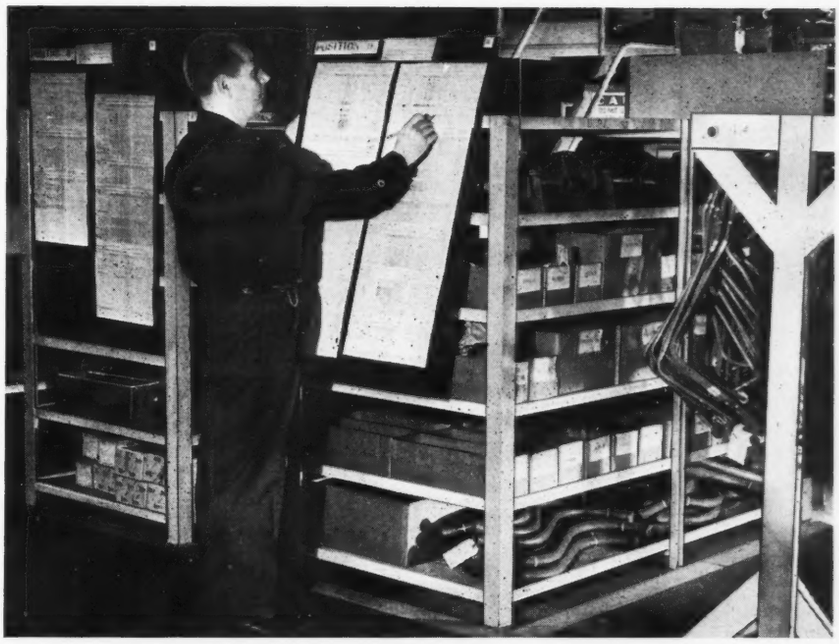


Fig. 4. A material control man "checks in" the parts he has just placed in the open bins by drawing a diagonal line through a ruled square on the stock sheet

used and the number still on hand, soon helped material control personnel to get the "feel" of the situation and act accordingly.

It has been noted also that substantially better "housekeeping" results from open-bin stocking. Pride in departmental appearance on the part of production employes, and pride in the appearance of the stock bins and racks on the part of material control personnel are the psychological factors accredited for this. It has also been found that fewer parts are damaged during storage than when they were hidden away in a haphazard manner on obscure stock-room shelves.

Loss of parts is no greater than when they were checked out of the stock-room individually. In a few cases, where exceptionally valuable government-furnished equipment is involved, locked cabinets or bins are used, and the head of that particular department is furnished with a key.

In the case of very complex products, such as the F-89 Scorpion, with its more than 30,000 manufactured components, it is evident that open-bin stocking is applicable only where one model is being produced. On the other hand, with simpler products, the system could probably be employed along assembly lines producing several models concurrently.

A final advantage of open-bin stocking is flexibility. The various racks and bins are constructed so that they can be easily transported from place to place with a conventional lift-truck. When it becomes necessary to move or expand a production line, the stock items applicable to a specific operation can be moved along with the jig or fixture in which that operation is accomplished.

A very good example of this flexibility occurred when it became necessary for Northrop to move its wing assembly department from one building to another. The move was started on Friday evening after the last shift was completed, and the production line was ready to operate by the following Monday morning. The tedious and time-consuming task of separating and withdrawing wing-assembly parts from one centralized stock-room and placing them in another was entirely eliminated.

* * *

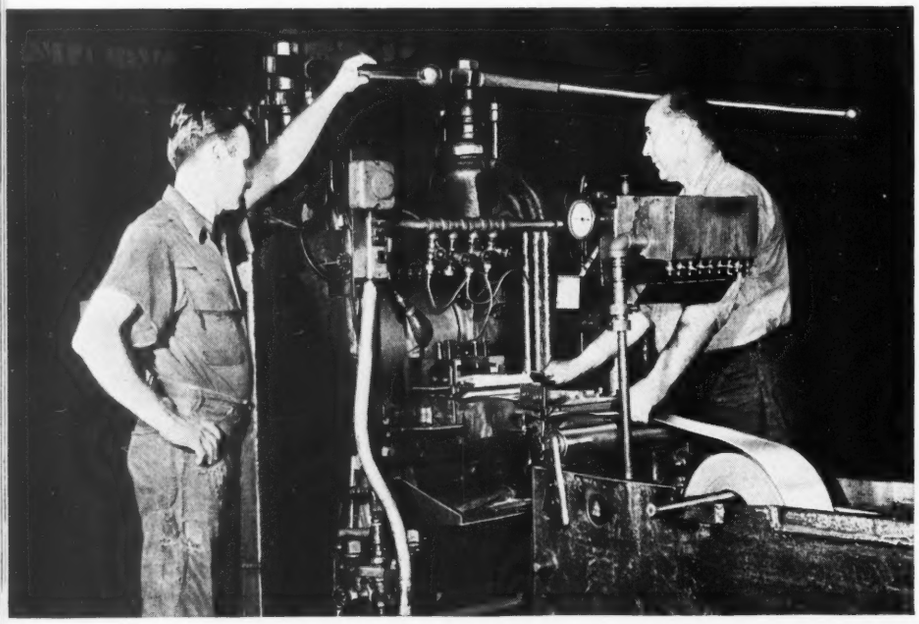
Westinghouse Radio Program Calling Attention to Shortage of Engineers

A radio program dramatizing the nation's critical need for engineers will be featured on "Adventures in Research," the Westinghouse Electric Corporation's radio science show, during the week of November 25. It will be broadcast to over 300 stations in the United States and abroad. This transcribed program is entitled "Supermen Wanted," and is part of a campaign being undertaken by the Engineering Manpower Commission of the Engineers' Joint Council.

* * *

Since the outbreak of Korean hostilities, the machine tool industry has had a rapid rise in employment and a substantial lengthening of its work week, according to a report by the Department of Labor's Bureau of Labor Statistics. Employment of wage and salary workers in the nation's 300 machine tool plants increased about 50 per cent from July, 1950, to March, 1951, reaching a total of more than 74,000.

Carbide Tooling Reduces Costs



Carbide is Extensively Used for Wear-Resistant Applications, as well as for Cutting Tools and Dies, at the Bridgeport Brass Co. This Article Describes These and Other Uses of Carbide under a System of Coordinated Carbide Control

By PAUL B. SCHUBERT

ONE of the most effective ways of gaining maximum benefits from the use of carbide in industrial plants is to control the means by which it is applied. A system of this sort provides a central source within a plant for supplying data on the proper use of various grades of carbide, as well as on the processing of carbides, correct speeds, feeds, handling, etc. Such a system is provided by the Coordinated Carbide Control Program recommended by Carboloy Department of the General Electric Co. The Bridgeport Brass Co., Bridgeport, Conn., has adopted a system of this kind, and set up a department to control the wide range of carbide applications in the plant.

Every department that is using or contemplating the use of carbide refers to this central control department for information of the type outlined. Various machine tools are used in this department for preparing pieces of carbide for use in the shop, as well as for machining steel tools and dies with carbide. Here carbide drawing dies are hand- and machine-lapped, carbide mandrels are ground, and carbide cutting tools are sharpened. High-speed steel dies, adapters, and other extrusion press and rolling mill equipment is machined with carbide tools. Experiments in the working of carbide and its proper use are conducted to solve problems that arise in other departments in the plant.

A typical problem that was solved by this carbide department occurred in the finish cold-rolling of strip brass. The operation consisted of rolling brass strip 6 to 8 inches wide on a two-high stand of rolls, as shown in the heading illustration. It was found that the guides used to align the brass strip as it entered the rolls wore to such an extent that deep grooves were formed in them. These grooves, approximately the thickness of the material, tore the edges of the brass strip before it entered the rolls. Hardened tool-steel guides lasted only six to twelve hours before they required grinding and readjustment.

The carbide department looked into the problem and suggested that Grade 55A Carboloy cemented-carbide inserts be used in the guides. Two milled recesses were provided in each guide for seating the carbide inserts. These inserts have now been in operation for over six months, and still show no signs of wear. A close-up view of the set-up, Fig. 1, shows the carbide inserts *A* in one of the guides.

Carbide is also used as inserts in dies and mandrels for the cold-drawing of square, round, hexagonal, and other shapes of wire stock. Grade 55A Carboloy cemented carbide is generally used for such applications. Maintenance and reworking of these tools are taken care of by the carbide department.

A 3/8-inch hexagonal-shaped carbide die is shown in Fig. 2 being lapped with a standard cold-rolled steel lap on a bench lapping machine. In this operation, "Near-A-Lard" and 320 grit silicon carbide are used as a lapping compound. As the die wears with use, it is reworked, so that it can be used to produce the next larger size of

in a Brass Mill

rod. In this way, depending upon the size of the original insert, a die may be used many times.

Round carbide-insert dies are rebored on a lathe (Fig. 3), using a diamond tool, and then lapped. In the operation illustrated, the tool is taking a 0.001-inch cut with a feed of 0.008 to 0.009 inch. The worn 0.810-inch bore is enlarged to 0.873 inch, a tolerance of plus 0.000, minus 0.001 inch being maintained.

Hand-lapping of a carbide-insert die is illustrated in Fig. 4. Brass, copper, and maple sticks, charged with Dymo-45 for rough-lapping or Dymo-6 for finish-lapping, are used. A small portable grinding machine (not shown) employing a 1/8-inch diameter diamond and carbide wheel is used for producing an entrance radius at the mouth of the die. This machine is run at a speed of 18,000 R.P.M.

Carbide-tipped mandrels used in the cold-drawing of tubing in this plant are reground by the carbide department when they are worn, so that they can be used again for producing tubing of the next smaller bore diameter. A grinding machine using a 7-inch diameter by 1/2-inch wide resin-bonded diamond wheel of 100 concentration, L hardness, is shown in Fig. 5 performing such a grinding operation. It will be noted that a coolant is used. A speed of 5000 surface feet per minute is employed, and 0.002 inch is ground from the outside diameter of the mandrel. This mandrel has a 1 1/4-inch Carboloy 55A tip. Its over-all length is 6 inches and the finished diameter is 1.187 inches. Customarily, 0.001 inch is left on the outside diameter for polishing by lapping.

Tool-steel dies, die-holders, and dummy blocks (the solid members used at the ends of the extrusion press rams) are other examples of parts machined in the carbide department with cemented-carbide tools. Two finish-machined die-holders, a die blank, and a finish-machined die are shown in Fig. 6.

The dummy blocks are made from hot-work alloy-steel forgings, 6 1/2 to 10 3/4 inches in diameter and 4 1/2 to 4 3/4 inches long, having a hardness of 38 to 40 Rockwell C. The finished size ranges from 6 to 10 1/4 inches in diameter by 3 to 4 5/16 inches long. When worn, a dummy block can be annealed, rehardened, and then machined to the next smaller size.

Among the machining operations performed

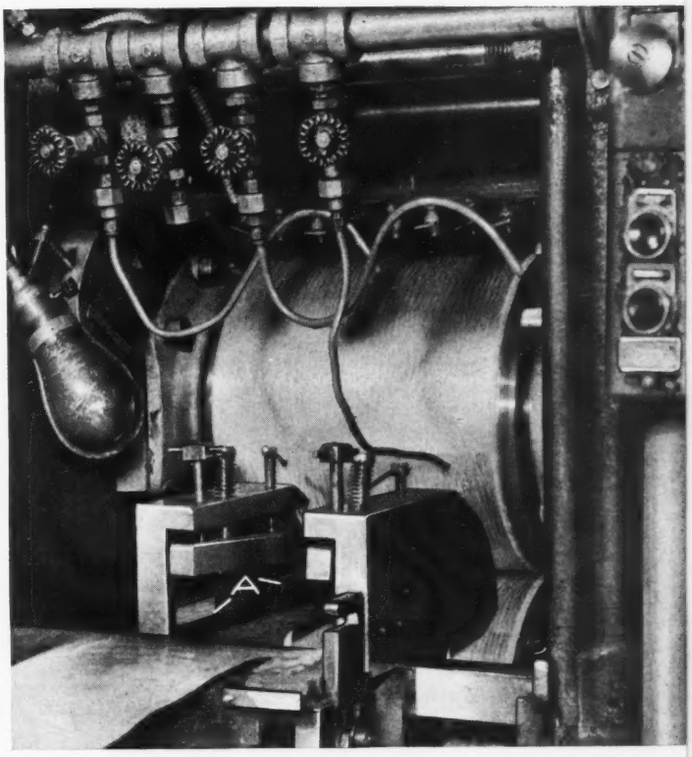


Fig. 1. Carbide inserts at (A) possessing great wear resistance increase the life of guides in the cold-rolling of strip brass

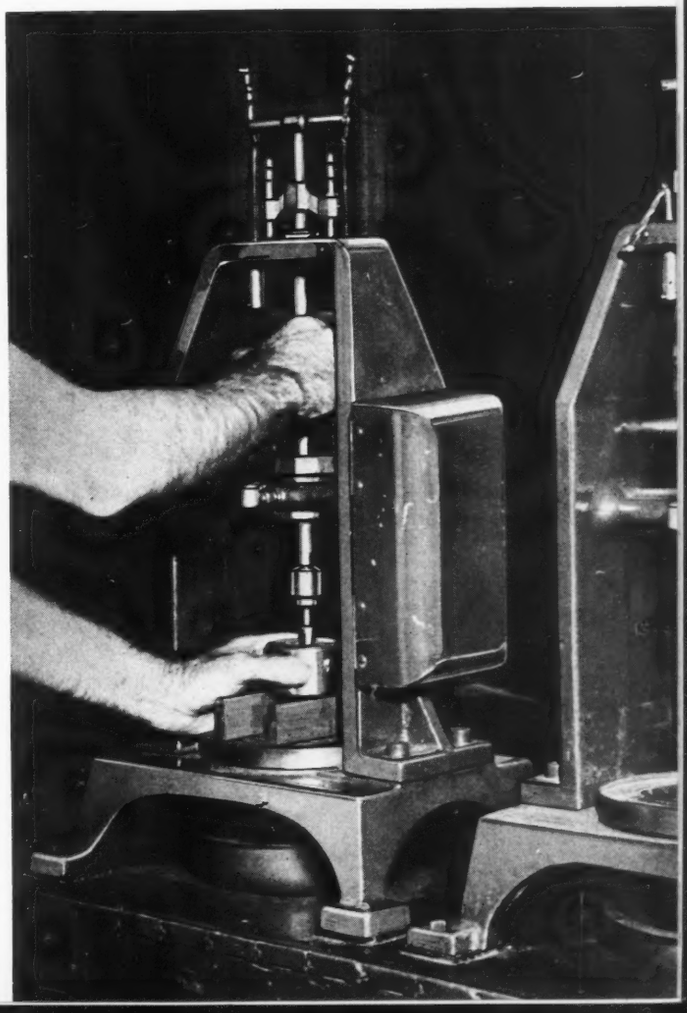


Fig. 2. Lapping a 3/8-inch hexagonal die with a standard cold-rolled steel lap on a bench lapping machine

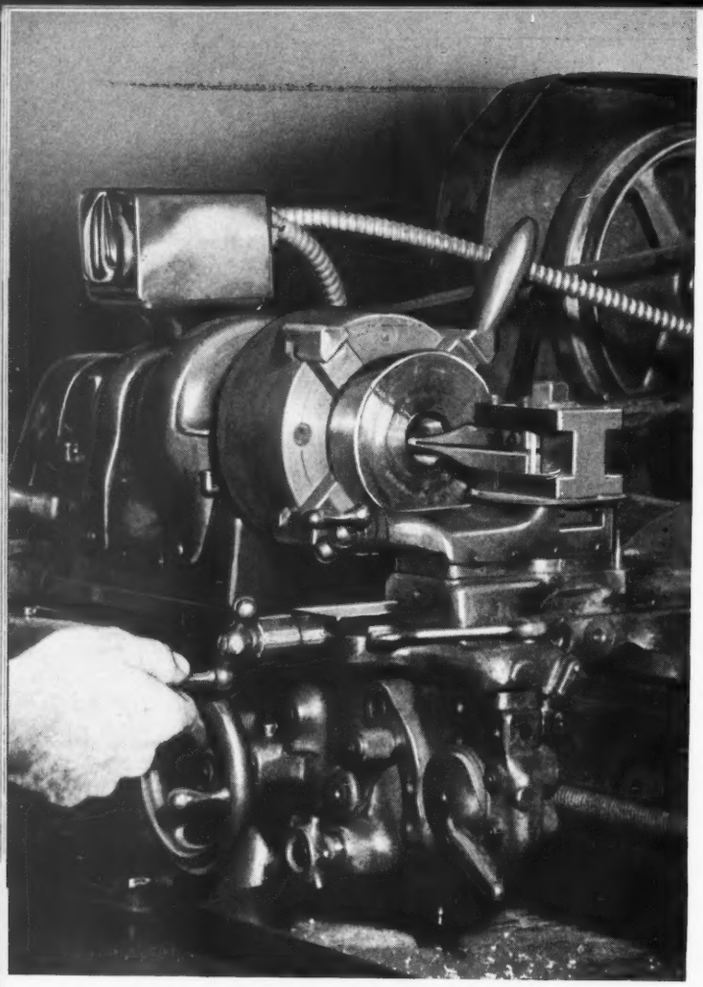


Fig. 3. A diamond tool taking a 0.001-inch cut in reboring a carbide die. The worn 0.810-inch bore is enlarged to 0.873 inch diameter, within a tolerance of plus 0.000, minus 0.001 inch

on this work are turning, facing, and boring. In Fig. 7, a dummy block held in the chuck of a turret lathe is seen undergoing a facing operation with a spindle speed of 129 R.P.M. and a feed of 0.030 inch, using a grade 78B Carboloy tool bit. This operation is followed by turning with a feed of 0.030 inch, using a Grade 78B Carboloy insert held in a special mechanical toolholder *A*.

The firmness of the insert in this holder permits the use of a harder grade of carbide than could ordinarily be used in a standard brazed tool. The carbide insert is of cylindrical shape, and is inserted in a hole in the end of the toolholder. An adjusting screw on the bottom of the holder facilitates making the correct height setting of the carbide insert.

From eight to twelve cutting positions are obtained by rotating the insert in the holder. Turning the insert, end for end, makes another eight to twelve cutting edges available before resharpening is necessary. The position of the hole into which the carbide insert is placed is such that the insert has both a negative front rake and a negative side rake of about 6 to 7 degrees with respect to the work.

Following the turning operation is the forming of the radius on the corner. This is done with a high-speed steel tool. The dummy block is then turned, end for end, in the chuck and the same machining operations are repeated. These blocks are machined to size in about thirty-five minutes, which represents a saving in time of about 400 to 500 per cent over previous methods. The time saving can be attributed to the use of carbide tools.

Extrusion dies machined by the carbide department are made of hot-work alloy steel having a hardness of 33 to 40 Rockwell C. The forging size of some of these dies is 5 5/8 inches diameter by 2 1/8 inches long, the dies being finished to 5 1/2 inches diameter by 2 inches long. Using carbide tools to machine them in a set-up similar to that described for the dummy blocks, the dies are turned, bored, faced, and formed—ready for grinding and polishing—in twenty-five minutes. The previous machining time for these dies was from 2 to 2 1/2 hours each.

The cylindrical carbide insert used to turn the outside diameter of the dummy blocks and dies is

Fig. 4. Carbide-insert die is shown being hand-lapped. Brass, copper, and maple sticks are used, charged with different compounds for rough- and finish-lapping

Fig. 5. Regrinding a carbide-tipped mandrel, the diameter being reduced from 1.240 inches to 1.187 inches within limits of plus 0.001, minus 0.000 inch

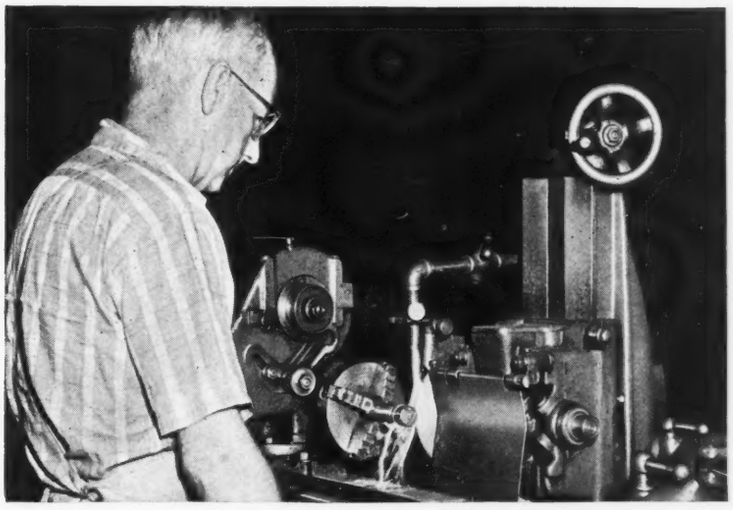
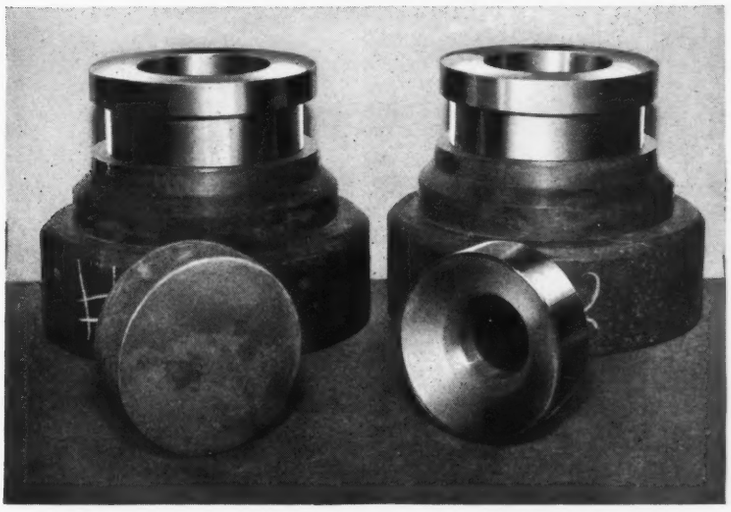


Fig. 6. Examples of parts machined in the carbide department with cemented-carbide tools. Larger pieces in background are finish-machined die-holders; a die blank and a finish-machined die are seen in foreground



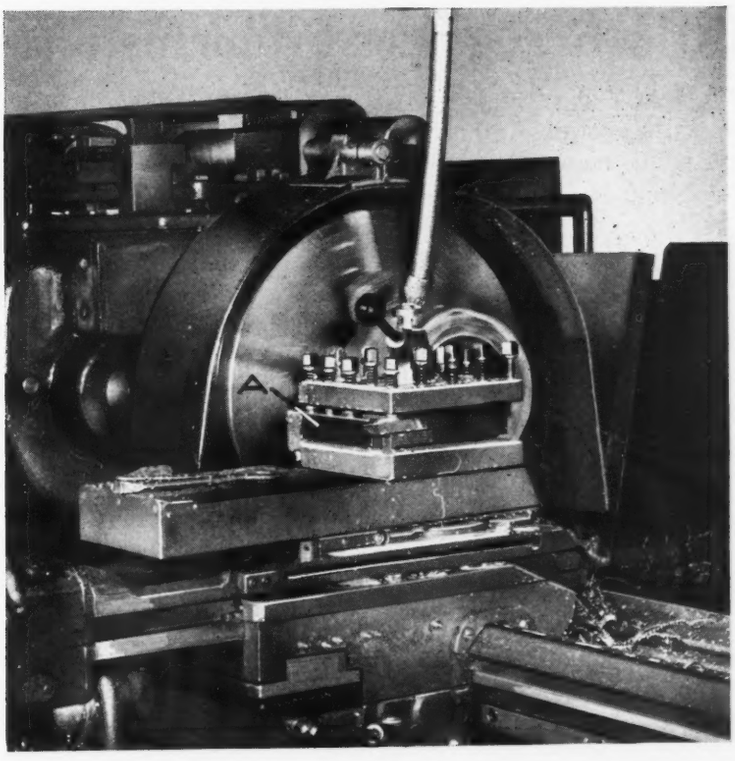


Fig. 7. Dummy block undergoing a facing operation. Special mechanical holder for cylindrical carbide insert is shown at (A)

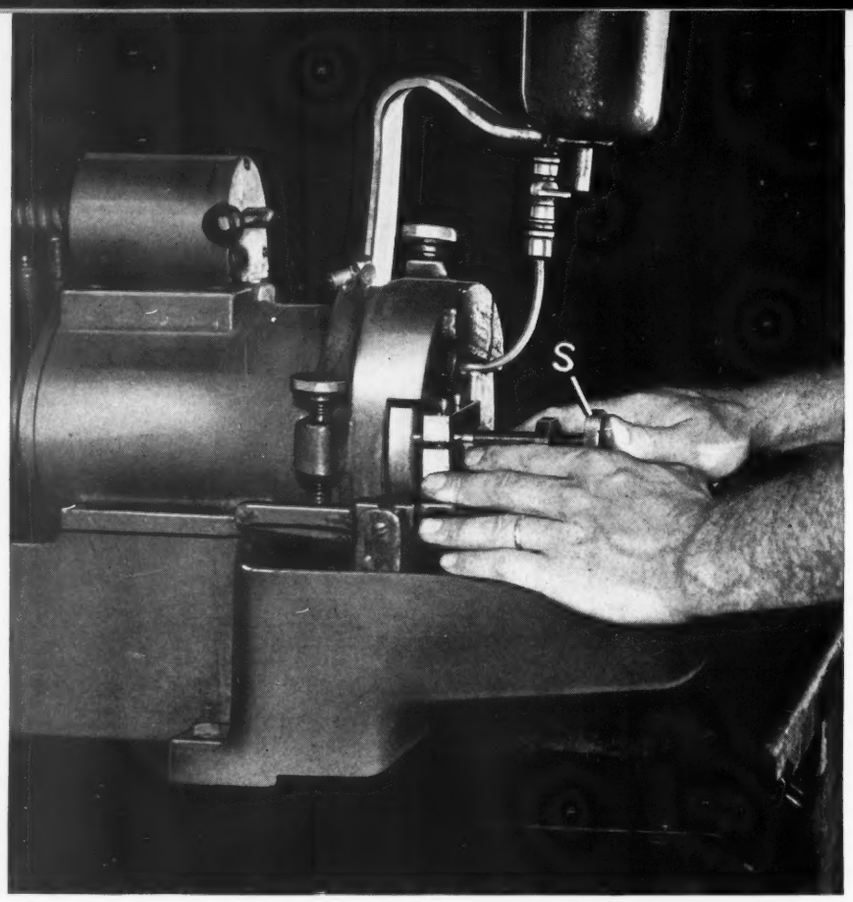


Fig. 8. Grinding carbide insert shown in use in Fig. 7. Knurled screw (S) is employed to feed the tool into a metal-bonded diamond wheel

ground while held in a special fixture on a bench grinding machine, as shown in Fig. 8. A metal-bonded diamond wheel is employed for this operation. On the bottom of the fixture is a key which slides in a groove in the base of the grinder that is parallel with the side face of the grinding wheel. Since the insert is held perpendicular to the side face of the wheel, the end is squared off as it is fed across the face of the wheel. The insert is held between a clamping strap and the fixture body, both members being shaped so that round, square, rectangular, or triangular-shaped inserts can be clamped. The clamping action is accomplished by means of two screws. The movement of the insert into the side face of the wheel is controlled by means of knurled-head screw *S*.

NPA Recognizes Problems of Machine Tool Builders

A FACT sheet recently issued by the National Production Authority outlines in an understanding manner the problems of the machine tool industry. This fact sheet is intended for the guidance of government officials in their dealings with the industry and with public relations problems arising from the Government's efforts to increase the industry's output. The fact sheet reads as follows:

During 1951, a major mobilization production problem has been machine tools. Output has increased steadily during the year, but the backlog of orders has increased even more. Several important actions were taken to increase the rate of output. These included the pricing order issued by the Office of Price Stabilization, pool orders, increased allotments of controlled materials, and the establishment of a policy by NPA that machine tool builders would have first call upon the output of their own industry for expansion purposes.

As the industry expanded its production during the year, labor problems increased and recruiting and training efforts had to be stepped up. Greater pirating of workers by other defense plants was noted. Because of the general slow-down during the July vacation period, output for this one month dropped sharply but rebounded immediately. In specific details, the machine tool program shapes up about as stated in the following:

1. There continues to be a critical shortage of steel plate and certain special types of steel. Too often machines have to be taken off production lines uncompleted for lack of steel and components and certain items of steel needed for completion.

2. The price bottleneck has been broken somewhat by revisions to Ceiling Price Regulation 30. This has given the machine tool builders an incentive to produce more tools, providing the materials are available.

3. Manpower remains one of the greatest problems faced by machine tool builders. Highly skilled mechanics are needed in this industry. The machine tool builders complain that they hire a "learner" at $1.50 per hour; then in a month or two, other industries, new defense plants, etc., hire the "learner" as a turret lathe operator at $1.90 an hour. As production is increased, manpower shortages will become more acute.

4. Industry now places the backlog of orders at $1,371,370,000, or more than two years' production at the present annual "going rate" of $600,000,000. Since both the manpower and materials situations are critical, backlog will probably continue to increase in ratio to new orders placed with the builders. (One word of caution about comparing backlog figures: Machine tools, unit for unit, are today both more complicated and more expensive than they were during the second World War, and prices are continuing to increase. This means that a backlog figure of the same dollar amount in the two periods—World War II and the present time—would actually represent a backlog of fewer machine tool units; perhaps this would be equivalent to as much as 30 per cent fewer units.)

5. During normal times, machine tool builders are prepared to finance their operations. However, stepped-up production imposes an additional financial burden which many builders are unable to meet. It is hoped that substantial relief will be given through government-guaranteed "V-loan" advance payments on pool orders.

6. Pool order contracts are being given machine tool builders in increasing numbers by the Government. These orders accomplish three things. First, they assure the manufacturer of a market for his machines; second, they assure the Government that the types and sizes of machine tools most needed in the mobilization effort will be produced; and third, the contracts provide that advance payments up to 30 per cent of the price of the machines may be made, thus easing the financial load of the manufacturers during the period of expanded output.

In any general consideration of the machine tool industry and its relationship to the mobilization program, a number of key facts should be kept in mind.

In the first place, the industry is smaller—in terms of the number of active firms or the total number of workers employed—than it was when the United States entered World War II. At that time the industry had two years of "forced draft" operation behind it, with orders from all of the European countries who were opposing the Nazis. Then, when the war ended, about one-fifth of the machine tool companies discontinued their business in this field, and either dropped out of the industrial scene altogether or shifted to other lines of production.

The second point is that the companies now in the business have this boom-and-bust experience still vividly in mind. They know that the war-inflated expansion of the industry during World War II caused serious trouble in the reconversion period. Management is more reluctant this time to rush headlong into a plant and facilities expansion program because of past experience. It is the job of the Government to encourage expansion for the mobilization effort; but the industry must be assured that safeguards are placed against abrupt contract termination and depressed markets due to government surplus property disposals.

From this highlight review of the machine tool production problem, it can readily be seen that the matter is a complex one. It is the considered opinion of those in the industry, and in the Government, that the potential increase in new mobilization orders will be greater than the increase in machine tool shipments in the months ahead; hence, the problem, on a relative basis, is likely to get worse before it gets better. A climax will probably be reached sometime in late 1952 or early 1953, after which production will be high enough to work off the backlog of orders and the critical nature of the problem should be ameliorated.

* * *

The American Worker as Seen through British Eyes

The American worker today is the highest paid in the world, and the purchasing power of his income places him in a class by himself. A high level of both income and production has resulted in a standard of living which far exceeds anything so far known. To earn a pair of men's shoes in the United States takes about seven hours, against fifteen hours in Great Britain; to earn a man's suit in the United States takes three days, compared with three weeks in Britain.—*Excerpt from a report by a British productivity team, released by the Anglo-American Council on Productivity.*

* * *

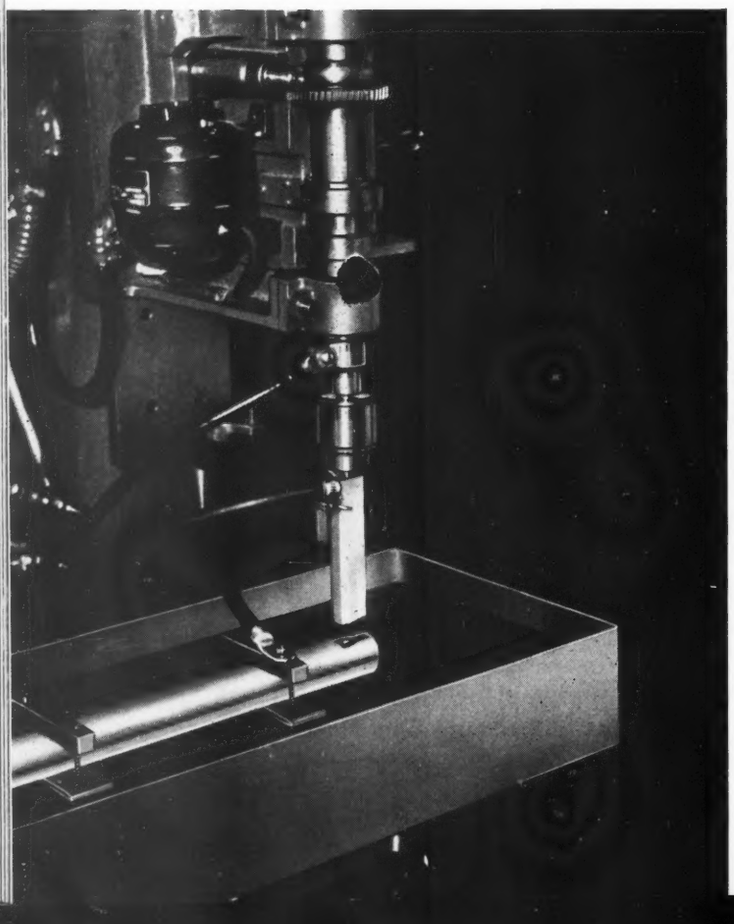
Scrap amounting to 29,500,000 gross tons was consumed in making steel for 1950. The estimated requirement for 1951 is 32,500,000 gross tons, and in 1952, an additional 3,000,000 tons of purchased scrap may be needed.

A Revolutionary New Method

By JOHN S. ROLLER, General Manager
The Method X Co.
Philadelphia, Pa.

A COMPLETELY new method of metal removal, known as "Method X," which applies electrical energy directly for "machining" any electrically conductive material has been developed by the Method X Co. of Philadelphia, an affiliate of the Firth Sterling Steel & Carbide Corporation. In this process, metal is removed by means of an electric spark discharge that does not affect the physical or chemical characteristics of the work.

The action is a mechanical rather than a thermal one. Internal mechanical stresses are set up by the use of electric current of extremely high densities, which causes the metal particles to be detached from the work without being melted. Thus the exposed surfaces remain unchanged, and surface finishes of 26 micro-inches r.m.s. can be obtained. By removing less than 0.001 inch of stock in a subsequent lapping operation, any desired finish can be produced on sintered carbide. Center-to-center spacing of holes through a work-piece can be controlled to approximately 0.0005 inch, and blind-hole fillet radii can be made as small as 0.002 inch.



The difficulty of fabricating sintered carbides, "super alloys," S-816, Vitallium, and hardened steels has somewhat restricted their use. Now the Method X process extends the application of these hard-to-machine metals by the possibility of forming complicated geometric shapes economically and rapidly.

Gas-turbine blade contours and root serrations can be readily shaped, and sintered-carbide die sections can be bored and tapped, so that direct fastening to the backing blocks with machine screws can be accomplished. Complicated shapes can be rapidly produced in the hardest of metals. Examples of gear and ring compacting-die sections produced directly in solid sintered carbide are seen in Fig. 2. The punch for the gear section can also be "machined" in sintered carbide by using a shaped electrode as the "cutting tool." The spline-shaped electrode seen at the upper left is made of brass.

The problem of warpage encountered in heat-treating steel dies for such parts as electrical stator laminations having a series of symmetrical-shaped holes can be eliminated completely by first heat-treating the solid steel section, and then producing holes of the desired shape by Method X. When heated, partially sintered carbides undergo a shrinkage of 15 to 20 per cent, which is not uniform in all directions. It is, therefore, impractical to form several holes in the half-sintered carbide and expect the hole centers to remain within close measurements after complete sintering.

By utilizing the new method, simple geometric shapes can be produced as hardened pieces and then accurate machining of the desired holes can be done rapidly and accurately. Much of the laborious grinding and lapping time usually associated with sectional dies is thus eliminated.

The equivalent of all machining operations ordinarily accomplished in metal-working, such as boring, drilling, tapping, internal and external shaping, and engraving can be accomplished by using the electrode as a "cutting tool." In addition, Method X can perform some operations not

Fig. 1. Machine employed for Method X resembles a drill press with a pedestal type base. It is equipped with an electrode feed and control mechanism and a remote unit power supply

of "Machining" Hard Metals

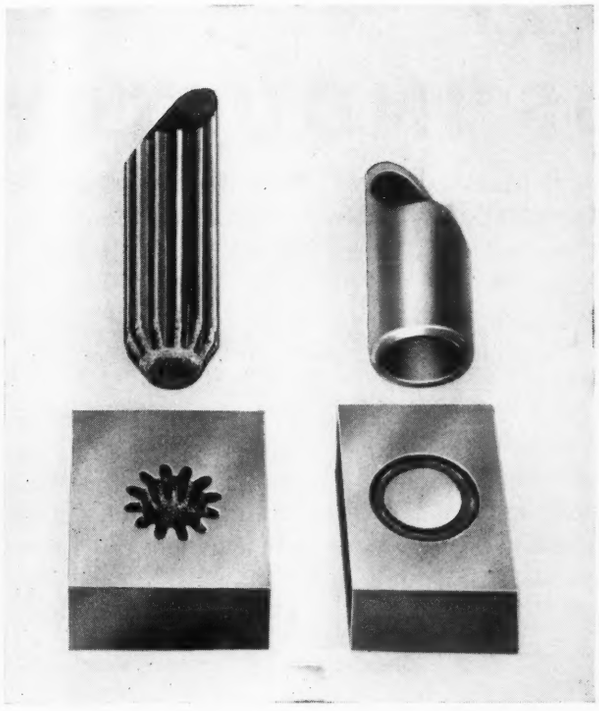


Fig. 2. Gear (lower left) and ring compacting-die (right) sections produced directly in solid sintered carbide by Method X. The spline-shaped electrode (upper left) is made of brass

Fig. 3. A blind, triangular-shaped hole having an integral pin was produced in this work-piece. The electrode is seen reflected in the dielectric fluid below the hole in the work

practical even with ordinary machinable materials on conventional machines.

For example, the work-piece seen in Fig. 3 has a blind, triangular-shaped hole in it, which is open at the apex and has an integral pin located in the center of the triangle. The shape is formed by the use of an electrode made to the shape desired and fed directly into the work-piece. A finishing operation is performed with the same electrode after the eroded end of the electrode has been cut off and the necessary electrical adjustments have been made.

The machine employed in this process, as seen in Fig. 1, is similar in design to a drill press with a pedestal type base. It is equipped with an electrode feed and control mechanism and a remote unit power supply. The machine has a worktable with longitudinal, lateral, and vertical traverse. It can be completely rotated for work alignment. Electrode feed is automatically controlled by an Amplidyne and associated circuits, so that optimum cutting speeds for a given condition are maintained. The power supply is from 220-volt, 60-cycle, single-phase electrical lines. The peak demand under the most severe cutting conditions does not exceed 7 kilowatts.

During the operation, the work is submerged in a dielectric fluid, such as fuel oil, kerosene, or a compound especially developed for this purpose, "Dielectro X." The purpose of this is, first, to build up electrical resistance, so that the energy storage devices in the machine may be fully charged prior to discharge, and, second, to flush the loosened particles from the work area. No fluid is lost except what evaporates or is carried off on the fabricated parts.

The electrodes are made of a highly conductive, easily machined material, such as brass, although other conductive materials can be employed. In cases where the operation can be performed with the head moving in a vertical direction, the electrodes are usually machined to a shape corresponding with that to be produced.

* * *

At the National Standardization Conference held in New York City recently, ex-President Herbert Hoover was presented with the Howard Coonley Medal, which is awarded annually by the ASA for outstanding service in advancing national economy through voluntary standards.

Materials OF INDUSTRY

The Properties and New Applications of Materials Used in the Mechanical Industries

New Heat- and Corrosion-Resistant Alloy Conserves Nickel

A new alloy intended for use under conditions of high temperature and corrosion has been placed on the market by the International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. The alloy, known as "Incoloy," was developed to conserve nickel supplies during the present emergency. It contains about 35 per cent nickel and 20 per cent chromium, with the balance iron. The new alloy will fill many of the purposes served by the older alloys, some of which have a nickel content of 70 per cent or more. It is produced in most standard rolling mill forms, including sheet, strip, rod, wire, and tubing. 1

Improved Method of Making Masonite Die Stock Gives Uniform Strength

Masonite die stock of improved quality is said to result from a new manufacturing process developed by the Masonite Corporation, 221 N. LaSalle St., Chicago, Ill. The product has greater uniformity of strength than previously and contains less than 3 per cent voids. It weighs less than one-half as much as aluminum and one-sixth as much as steel.

Masonite die stock is used in the aircraft and many other industries for experimental tooling, mock-ups, and models. It is available in panels 48 inches wide and 36, 72, or 144 inches in length. Standard thicknesses range from 1/4 inch to 2 inches. 2

Lead-Free Aluminum Solder Rod for Use with Soldering Iron

A lead-free aluminum solder rod melting at 400 degrees F. and flowing at 450 degrees F. has been added to the line of the All-State Welding Alloys Co., Inc., White Plains, N. Y. No. 37 aluminum solder rod, as it is called, can be applied either by a soldering iron or indirect heating. Properly applied, it will withstand pressures of 1000 pounds per square inch. It is used on all types of aluminum except 24S-T, and can be employed for soldering aluminum to dissimilar metals. Good matching color and corrosion resistance are said to have been obtained in such applications as electric signs, television and radio parts, lighting fixtures, and electronic equipment. Sizes of 1/8 inch by 18 inches and 1/4 inch by 14 inches are available in 5-pound packages. 3

Haynes Stellite Alloys Now Available in Thin Gages

General Plate, Division of Metals and Controls Corporation, Attleboro, Mass., announces that Hastelloy and Haynes corrosion-resistant, high-strength, high-temperature alloys are now available in thin gages. These alloys are being hot-rolled in thicknesses down to 0.050 and 0.025 inch. The four most common alloys supplied in these gages are Haynes Alloy 25 (L-605), Hastelloy B, Hastelloy C, and Haynes Stellite Multimet (N-155).

The standard processed width of the alloys is 6 inches, but widths up to 8 inches can be furnished. The alloys can be supplied in either flat lengths or coils. The maximum weight per strip is about 2 pounds per inch of width. 4

Quick-Acting Solvent Cleaner for Metal Surfaces

A soak solvent known as "Dynakleen," designed specifically for the quick removal of buffing and drawing compounds from knurled or fluted surfaces of all metals, has been brought out by the Du-Lite Chemical Corporation, Middletown, Conn. The new cleaning compound is said to remove all types of foreign matter, including greases, oils, and discolorations. It can be used in spray washing machines or applied by hand.

To obtain additional information about materials described here, use Inquiry Card on page 229.

"Dynakleen" dries quickly and can be used repeatedly with only occasional filtration. It is useful for preparing metal surfaces for plating, painting, Parkerizing, bonderizing, and galvanizing. 5

Hard-Facing Rod for Abrasion-Resistant Applications

The Wall Colmonoy Corporation, 19345 John R St., Detroit, Mich., has recently brought out a hard-facing rod called "Wallex." This rod is said to have excellent resistance to abrasion, as well as good impact and corrosion resistance. It has a hardness of 57 to 61 Rockwell C, a melting point of approximately 2375 degrees F., and is easily welded. "Wallex" is available in 8- to 12-inch lengths, and in diameters of 3/16, 1/4, and 5/16 inch. Among its numerous applications are conveyor parts, rolling mill guides, drag-chain idlers, etc. 6

Plastic-Armored Metal Tubing Made in a Variety of Shapes

Square, triangular, oval, and streamline shapes have been added to the standard line of round Dekoron plastic-armored metal tubing made by Samuel Moore & Co., Mantua, Ohio. This product consists of plastic-coated seamless tubing or plastic-coated tubing with welded, lap, or butt seams. It will not crack, chip, peel, or flake, and is said to resist corrosion from salt air, moisture, oils, acids, and alkalies.

Made in a large variety of sizes, colors, and finishes, the tubing can be used in many industrial applications, as, for example, in automotive parts, industrial instruments, and electrical conduit lines. 7

A Copper-Clad Steel Designed to Replace Solid Copper Sheets

Copper-clad metal, said to permit a saving of 80 per cent of copper in certain applications, has been placed on the market by American Cladmetals Co., Carnegie, Pa. "ElectroShield," as this metal is called, consists of a base sheet of low-carbon magnetic steel, usually S A E 1010, to which is metallurgically bonded, on either one side or both sides, commercially pure rolled copper.

The copper-clad metal exhibits a resistance to corrosion and low thermal expansion properties. It is stronger and lighter than a comparable thickness of pure copper, is ductile and easy to work, and can be resistance-welded, soldered, and brazed. Such operations as drawing, spinning, stamping, and punching can be performed on it.

While originally developed to provide improved shielding and housing of electronic equipment, such as radar and radio, its application has been extended to many other fields where products are made of copper sheet, such as the automotive, refrigeration, hardware, and chemical industries.

ElectroShield sheets are furnished in standard sheet-metal thicknesses, in widths up to 48 inches, and in lengths up to 132 inches. They can be supplied in standard mill gages and sheet sizes, either hot- or cold-rolled, annealed, pickled, and leveled. The new metal is also available in light plates. 8

Soluble Oil for Sawing, Slitting, and Slotting Operations

A heavy-duty cutting compound called "Triple-Chip" heavy-duty "anti-weld" soluble oil has been developed by the Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio. This oil withstands high heat for long periods, adheres to the tool, mixes readily with water, and resists contamination. It is said to keep chips from "welding" to the tool and flying from the work-piece. Other advantages are that it resists rusting, is non-injurious to the skin, odorless, smokeless, non-corrosive, and maintains its properties in storage. The new cutting compound is claimed to lengthen tool life..... 9

Plastic with Punching and Machining Qualities Similar to Brass

Glass-fiber reinforced plastic sheet that can be machined is a recent product of the Dynakon Corporation, Cleveland 3, Ohio. The new plastic material, designated A3A, is said to have punching and machining qualities similar to brass, while retaining the outstanding properties characteristic of this kind of plastic.

The sheet, available in thicknesses of 1/8, 3/16 and 1/4 inch, has a tensile strength of 11,900 pounds per square inch and a compressive strength of 14,300 pounds per square inch. It is chemically resistant to acids, salts, and mild alkalies, as well as most organic solvents, and has a water absorption of only 0.39 per cent. Electrical properties include dielectric strength of 325 volts per mil, arc resistance of 120 seconds, and power factor of 4.24. The dielectric constant is 4.83, and the specific gravity 1.38..... 10

To obtain additional information about materials described here, use Inquiry Card on page 229.

Annual Meeting of the American Society of Mechanical Engineers

ENGINEERS from all over the country will meet on November 26 to 30 at the Chalfonte-Haddon Hall in Atlantic City, N. J., for the seventy-second annual convention of the American Society of Mechanical Engineers. It is anticipated that last year's record program of papers will be exceeded by 10 per cent. More than ninety sessions are planned.

Reginald J. S. Pigott, president of the American Society of Mechanical Engineers for the coming year

One of the important features of the meeting will be a production engineering clinic, to be held on Tuesday, November 27, in morning and afternoon sessions, with a luncheon between. The topics to be covered in the morning include purchase engineering; production facilities—equipment and tooling; production processes—machining, welding, casting, stamping, assembly, etc.; inspection—receiving, intermediate, and final. In the afternoon the subjects to be discussed will include quality engineering and control; production specifications—drawings, process sheets, routings, materials handling, location, etc.

During the production engineering luncheon, the subject of developing a manufacturing engineering organization will be discussed, with R. H. McCarthy, superintendent of manufacturing engineering, Western Electric Co., Inc., Kearny, N. J., presiding.

Other papers of especial interest to metalworking plants that will be presented at different sessions of the convention are the following: "This Thing Called Productivity," by Ewan Clague, United States Commissioner of Labor Statistics, Bureau of Labor Statistics, Washington, D. C.; "Tool Forces and Tool-Chip Adhesion in the Machining of Nodular Cast Iron" and "Thermophysical Aspects of Metal Cutting," by K. J. Trigger, L. B. Zylstra, and B. T. Chao, Department of Mechanical Engineering, University of Illinois, Urbana, Ill.; "A Comparison of Parameters for the Machining of Gray Cast Iron," by L. V. Colwell, H. J. Holmes, and F. B. Rote, University of Michigan, Ann Arbor, Mich.; "The Mechanics of Three-Dimensional Cutting Operations" and "The Rotary Cutting Tool," by M. C. Shaw, N. H. Cook, and P. A. Smith, Massachusetts Institute of Technology, Cambridge, Mass.; "New Production Facilities," by Ralph J. Kraut, president, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; "How to Increase Productivity in Small Plants," by Frank K. Shallenberger, Graduate School of Business, Stanford, Calif.; "Measuring the Cooling Properties of Cutting Fluids," by George M. Hain, research chemist, Cincinnati Milling Machine Co., Cincinnati, Ohio; and "A Laboratory Method of Testing Cutting Fluids that Approximates Actual Shop Usage," by Thomas Badger, materials-engineering department, Westinghouse Electric Corporation, East Pittsburgh, Pa.

The incoming president of the American Society of Mechanical Engineers, Reginald J. S. Pigott, will preside over a luncheon at which honors will be awarded to William L. Batt, head of ECA for Great Britain; Thomas Roy Jones, president of Daystrom, Inc., Elizabeth, N. J.; and E. G. Bailey, vice-president of Babcock & Wilcox Co., New York City.

* * *

Machine Tool "Primer"

A booklet entitled "Machine Tools Today" has recently been published by the National Machine Tool Builders' Association. It tells what machine tools are and what they do, describes basic methods of cutting and forming metal, and gives general facts about the industry. Limited quantities are available upon request to the Association at 10525 Carnegie Ave., Cleveland 6, Ohio.

Important New Carbide Developed by Carboloy

AMONG the outstanding developments introduced at the Metal Show by the Carboloy Department of General Electric Co., Detroit, Mich., was an entirely new tungsten- and cobalt-free family of metallic carbides, to be known as Series 600. The new carbide, produced from powdered metals, contains approximately 70 per cent by weight of chromium, and is thus primarily a "chrome carbide." Owing to the unusual physical properties of this material, its introduction opens up many new applications for metallic carbides, field tests on several of which have been completed. A most important feature of the carbide is that costly and strategic tungsten and cobalt are not needed.

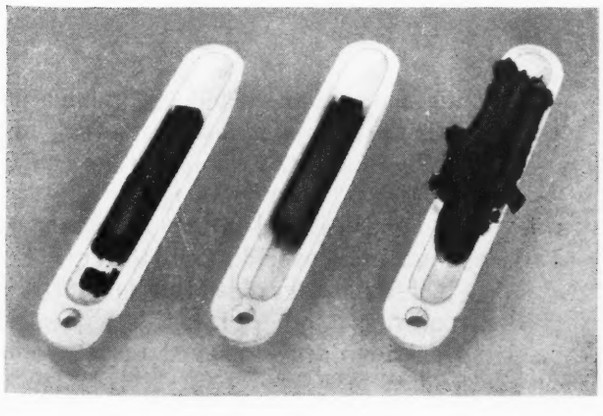
Outstanding properties of the new carbides include extremely high resistance to abrasion, erosion, and corrosion; lighter weight; a coefficient of thermal expansion approximately the same as that of steel; and extreme resistance to oxidation, even at high temperatures. They are completely non-magnetic, and their machinability is about the same as that of the tungsten carbides. Hardness is approximately the same as tungsten carbide at room temperatures (80 to 93 Rockwell A).

Although the new material may find some applications where tungsten carbides are used at present, it is not expected to supplant the latter. In the gage field, the Series 600 carbides are currently being used for the production of gage-blocks, ring gages, plug gages, and gage anvils (ribbed surface plates). The combination of erosion, corrosion, and abrasion resistance also accounts for the successful application of this material in centrifuge blades.

The Series 600 chrome carbides appear to be virtually completely resistant to oxidation at temperatures up to 1000 degrees C. (1832 degrees F.). When subjected to a temperature of 1850 degrees F. for twenty-four hours, samples (such as the one seen in the center of Fig. 1) still maintained their luster, while simultaneously exposed samples of 18–8 stainless steel (left) and tungsten carbide (right) had completely disintegrated. Favorable results also have been obtained in other tests conducted at temperatures of over 2000 degrees F.

At first, the new chrome carbide will be available in the complete size and shape range in which tungsten carbides are offered. However, there are apparently no inherent physical limitations to size and shape. The development of the new material is expected to lead to making complete parts of chrome carbide rather than using tips of the material. The Series 600 carbides can be brazed, and can also be attached by mechanical means. They lend themselves well to attachment by means of thermo-setting resin cements, when the use of such cements is feasible.

Fig. 1. Samples of 18-8 stainless steel (left), chrome carbide (center), and tungsten carbide (right) after exposure in air at 1850 degrees F. for twenty-four hours



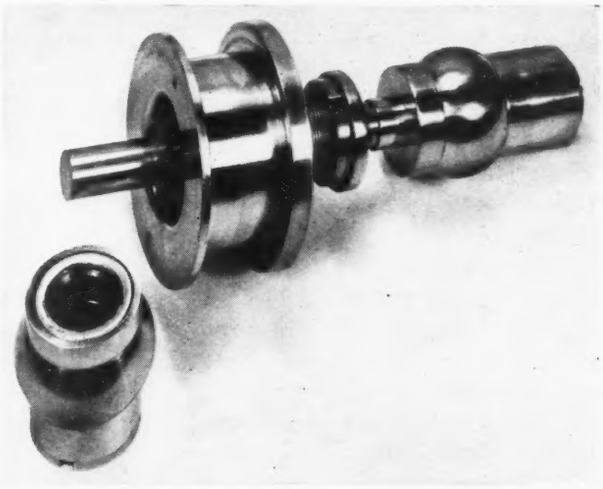


Fig. 2. High-speed grinder spindle and bearings made of cemented carbide. Machine thus equipped can grind parts within 0.0001 inch of required size

Fig. 3. A wear-resistant tungsten-carbide surface is being produced on a draw roll with conventional shielded arc-welding equipment and carbide welding rod

Successful Use of Carbide Bearings

Another new development shown by the company was the successful experimental use of cemented tungsten-carbide bearings under high speed, load, and temperature conditions where conventional bearings fail. Sleeve type bearings consisting of carbide running against carbide have been operated successfully at speeds up to 30,000 R.P.M. and at loads up to 2000 pounds per square inch. In a typical series of tests of a bearing 3/4 inch in diameter by 3/4 inch long, operated at 10,000 R.P.M., the temperature rise when the load was increased from 100 to 1000 pounds per square inch was only 5 degrees C.

Among the field installations of tungsten-carbide bearings that have proved successful where other bearing materials have given trouble are special high-speed grinder spindles (Fig. 2), operated under heavy loads. Both the spindle and the bearings, which were used on a Brown & Sharpe grinder, were made from tungsten carbide. The use of carbides permitted such small bearing clearances that ground parts could be held to 0.0001 inch and still leave sufficient stock for lapping. The time required for lapping was thus reduced by 50 per cent. Other applications of carbide bearings include pivots for gasoline pumps in which gasoline had to be used to lubricate the bearing; ways and slides of precision, high-speed machine tools; and bearings for shafts on high-speed balancing machines.

Carbide "Welding" Rods

The possibility of being able to coat metal parts with a relatively thin skin of ultra-hard, wear-resisting tungsten carbide was also announced. Basic laboratory development of a "weldable" tungsten carbide has been completed. This new material can be flowed onto metal surfaces, using conventional shielded, electric arc welding equipment, as seen in Fig. 3. The new rods are not yet in regular production, but are being made on an experimental basis at present in the same form and sizes as conventional welding rods, ranging from 1/16 to 1/4 inch in diameter.

When flowed onto a metallic surface, such as steel or iron, the carbide fuses and blends with the base metal, resulting in a coating containing approximately 70 per cent of wear-resisting tungsten carbide. A surface coated with tungsten carbide in this manner can be ground or polished with the same equipment used for solid tungsten-carbide parts.

Several types of "binders," including iron, nickel, and cobalt, have been used up to the present time in the experimental hard-surfacing rods. No final determination has yet been made as to the class of application for which each type of binder is best suited.

* * *

Supporting more than 36,000,000 pounds of dead weight in the towering new Narrows bridge at Tacoma, Wash., are 366 comparatively small alloy-steel castings. Over 16,000 tons of structural steel alone were used in this third longest suspension span in the world. Twin towers carry the 20 1/4-inch diameter cables that support the four-lane roadway; and here it is that alloy-steel cable band castings are employed to carry the immense load.

TOOL ENGINEERING Ideas

Tools and Fixtures of Unusual Design and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Vacuum Chuck for Holding and Ejecting Thin Discs

By BARUCH SPECTOR
Spector Engineering Service, Jamaica, N. Y.

Thin, non-ferrous discs can be securely held during grinding and ejected at the completion of the operation by means of the vacuum chuck shown in Fig. 1. Since non-ferrous parts cannot be held by magnetic chucks, this device provides a convenient method of exposing the entire upper surface of the disc to the grinding wheel. With the air valve set in one position, a vacuum is created on the under side of the disc, which holds it firmly on the chuck by atmospheric pressure. When the valve is reversed, the ground disc is blown from the chuck.

Body *A* of the chuck is fastened to the rotating table of a vertical-spindle grinding machine, while the stationary ring *B*, valve *C*, and the electric motor and vacuum pump (not shown) are secured to the frame of the machine. O-rings *D*, washer *E*, and a split flanged washer *F* keep the chuck air-tight.

Work-piece *G* is placed in a nest on top of the chuck body, and a pin *H*, pressed into the body, enters one of the four holes *J* previously pierced in the disc. The chuck body is drilled to provide the vertical air passages *K* and the horizontal air passages *L*. Pipe *M* connects one of the latter passages to the air valve *C*.

Enlarged views of the special air valve are shown in Fig. 2, with the valve setting for chucking seen at the left, and for ejecting at the right. Valve body *C* is bored to accommodate the tapered plug *N*. Dotted lines in both plan views show the cross-section of the plug in plane *Y–Y*.

Two angular air passages *O* and *P* are provided in the valve body, and two air passages *Q* and *R* in the tapered plug. While the angular holes in the body are in the same vertical plane, those in the plug are in vertical planes at 90 degrees to each other. Consequently, when the valve is set for chucking, as seen at the left, hole *R* is aligned with hole *O*, and air is sucked from the air passages in the chuck to create a vacuum under the work-piece. At the same time, hole *P* in the valve body is blocked off by the tapered plug. Thus air from the vacuum pump passes through the right half of hole *P* and an annular

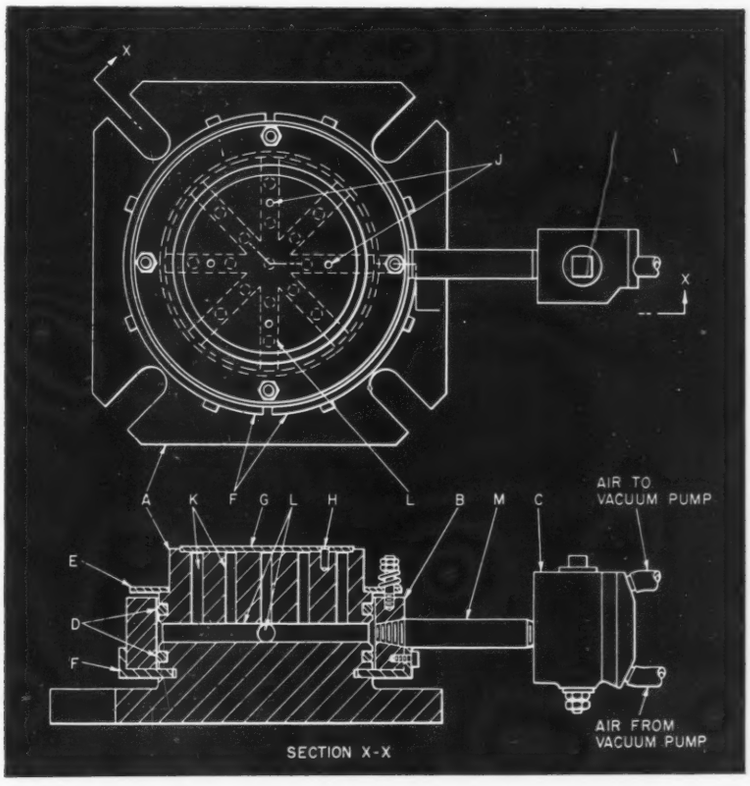


Fig. 1. Thin, non-ferrous disc (G) is held firmly in place during grinding by creating a vacuum in the chuck. When the setting of valve (C) is changed, the work-piece is blown from the chuck

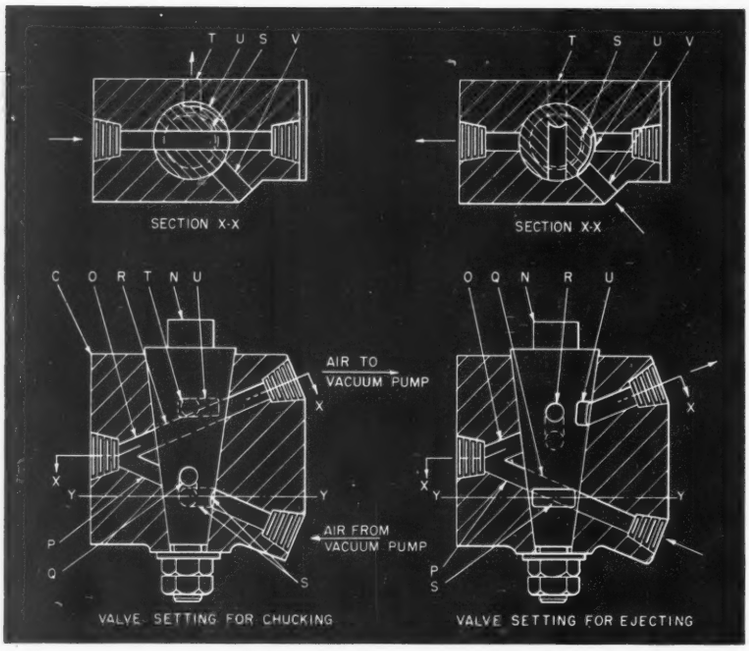


Fig. 2. Details of the special air valve employed on the vacuum chuck shown in Fig. 1. The valve setting for holding the work on the chuck is seen at the left, and that for ejecting the part at the right

groove *S* on the plug, and finally, through a hole *T* to the atmosphere.

When the plug is rotated through an angle of 90 degrees to set the valve for ejection, hole *Q* is aligned with hole *P*, and air from the vacuum pump is blown into the air passages in the chuck, lifting the work from the chuck.

Evacuation of air from the chuck is prevented by the tapered plug sealing the left half of hole *O*. However, air from the atmosphere is drawn into the pump, through hole *V* in the body, around annular groove *U* on the plug, and out the right half of hole *O*. In this position of the air valve, hole *T* is sealed from the atmosphere by the tapered plug.

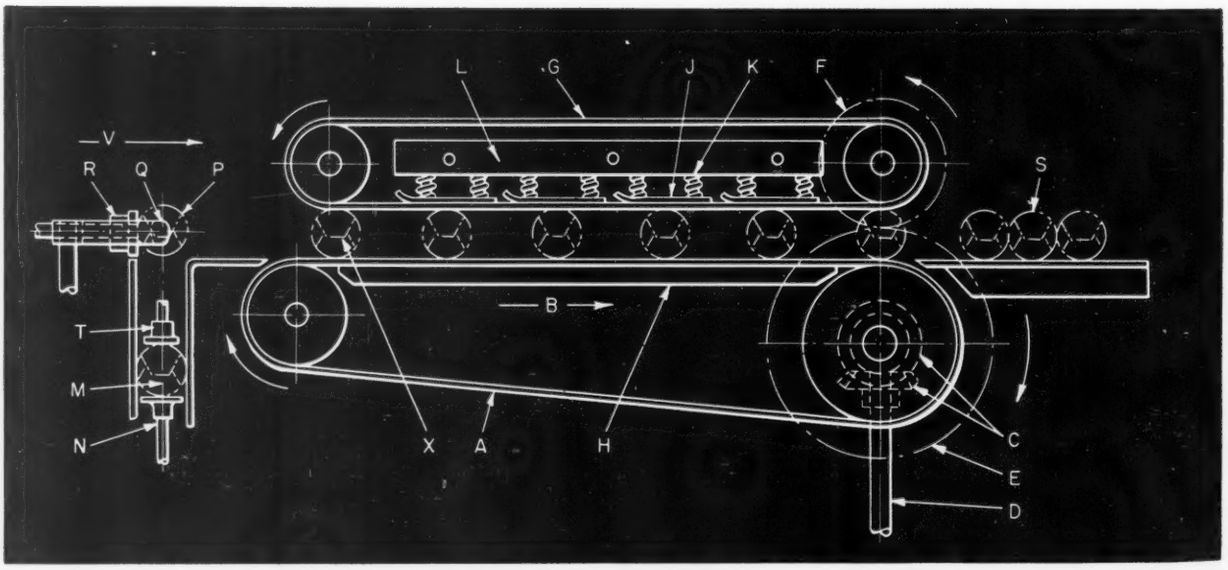
Conveying Cylindrical Packages without Rotation

By F. H. MAYOH, Pawtucket, R. I.

A conveying system designed to move cylindrical-shaped packages without permitting them to rotate, even though they lie horizontally and transversely on the conveyor, is shown in the accompanying illustration.

The conveyor consists primarily of two rotating belts *A* and *G*, which are each friction driven by a pulley and pass over an idler pulley. The upper belt *G* travels counter-clockwise, and the lower belt *A* in a clockwise direction.

The driving pulley of the lower belt is driven



Cylindrical packages are moved without being rotated by means of this conveyor, which holds the work by friction and pressure exerted by two belts operating at the same speed

from shaft *D* through two bevel gears *C*. Fastened to the same shaft as the driving shaft of the lower pulley is a large spur gear *E* which drives a smaller spur gear *F*. The latter is fastened to the shaft of the driving pulley for the upper belt. The spur gears are selected to give equal peripheral velocities to the two driving pulleys in order that the upper and lower belt speeds will be the same.

A supporting plate *H* prevents sag in the lower belt. Pressure is constantly applied to the belt above the work-pieces by means of four spring-loaded plates *J*. These plates and the springs *K* are supported by bar *L*.

The method of loading the cylindrical packages into the conveying system is shown at the left-hand end of the diagram. Package *M* is first clamped between the surfaces of the moving members *N* and *T* and moved upward, between two guides, to position *P*. At this point, a pair of arms moves forward and grips the package at its ends. Acting as an integral unit, the arms and pusher *R* now move to the right, as shown by arrow *V*, and place the package in the conveying system at position *X*. While the loading occurs, member *T* continues to move upward and member *N* reverses its direction and starts moving downward.

The packages are held in place between the belts by friction and pressure from plates *J*, and move in a straight path without rotating, since both the upper and lower belts move at the same speed. Packages are seen leaving the conveyor at *S*.

A typical application of this conveying system is the transportation of cylindrical packages that have glued longitudinal seams requiring pressure while drying.

Swiveling Tool-Holder for Cutting Oil-Grooves in Bushings

By T. R. SARGENT, Waterford, Conn.

Tools held in a boring-bar in the conventional manner and employed for cutting oil-grooves in medium-size bushings were found to have a very short life. The operation was performed on a horizontal boring machine equipped with a grooving attachment. Fig. 1 shows a development of a double oil-groove cut in a bushing 7 5/8 inches in diameter, which is typical of the work handled. When one of the endless oil-grooves had been cut, the bushing was indexed through an angle of 180 degrees, and the second groove shown was generated.

Since the tool, which was rigidly held in the boring-bar perpendicular to the bore of the bushing, had to be fed forward and then backward an equal amount during each revolution of the boring-bar, it had to be ground so that it could cut in both directions. Also, it was necessary to provide excessive side clearances on the tool to prevent interference because of the steep helix angles of the groove. The tool was therefore weakened and rapidly failed. Furthermore, the grooves produced in this way varied in width.

To overcome these faults, the tool-holder shown in Fig. 2 was designed. This holder is free to swivel in a vertical plane, so that the top cutting face of the tool bit will tend to assume a position perpendicular to its helical path of travel. In this way, grooves of uniform width are generated and a much longer tool life is obtained.

Tool bit *A* is located in holder *B* against stop-pin *C*, and is secured by a hexagon-socket set-screw *D*. The shank of the holder is a snug sliding fit in slip bushing *E* and liner bushing *F*,

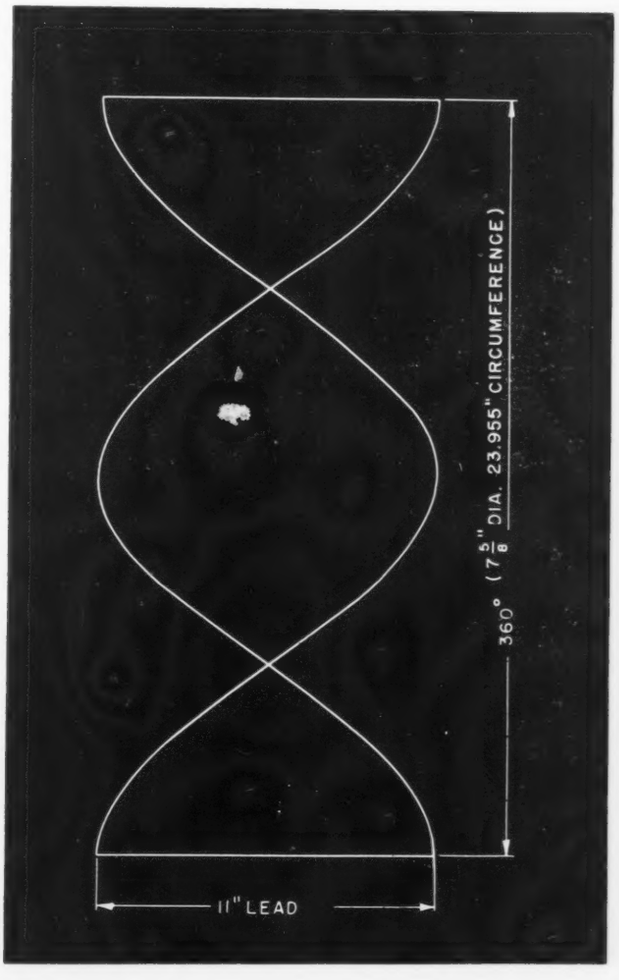


Fig. 1. Development of a double endless oil-groove having a lead of 11 inches, which is cut in the bore of a bushing 7 5/8 inches in diameter

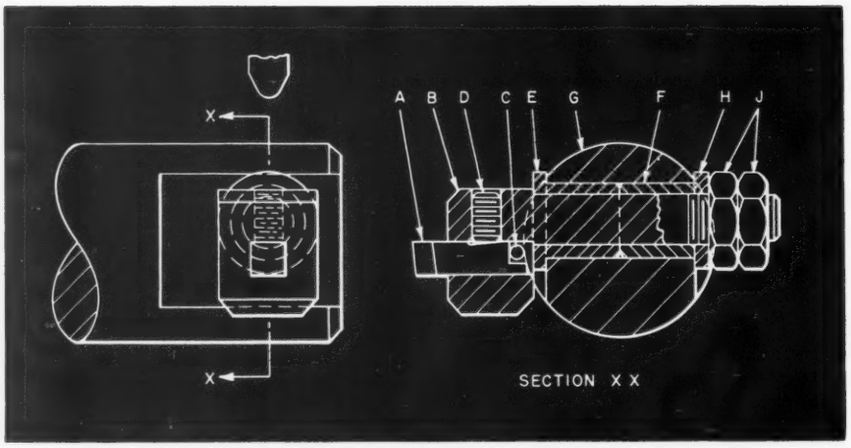


Fig. 2. Details of a swiveling tool-holder which permits the top cutting face of tool bit (A) to remain perpendicular to its path of travel

which are pressed into a cross-hole in boring-bar *G*. While the holder is free to swivel, it is prevented from moving axially by thrust washer *H* and lock-nuts *J*, which are screwed on the threaded end of the holder.

It is necessary that the tool bit be ground with minimum front and side clearance angles and no top side rake. The top cutting face of the tool is aligned with the center of the boring-bar, while the axis of the tool-holder shank is offset. The holder is, therefore, forced to swivel and keep the tool aligned with its path of travel.

Quick-Acting Jig for Drilling Radial Holes in a Bushing

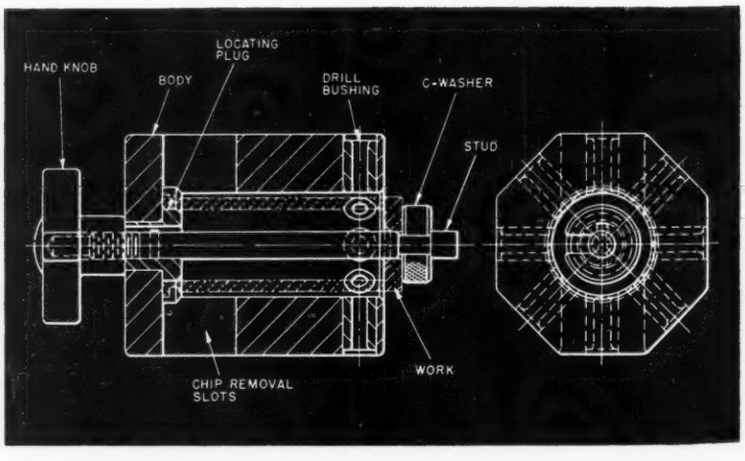
By ROBERT W. NEWTON, Tool Engineer
International Business Machines Corporation
Poughkeepsie, N. Y.

The drill jig here illustrated provides a simple and rapid means of clamping work, insures accuracy, gives ample space for chip removal and burr clearance, and is easily unloaded. It is employed for drilling eight equally spaced radial holes near one end of a spring-cage bushing.

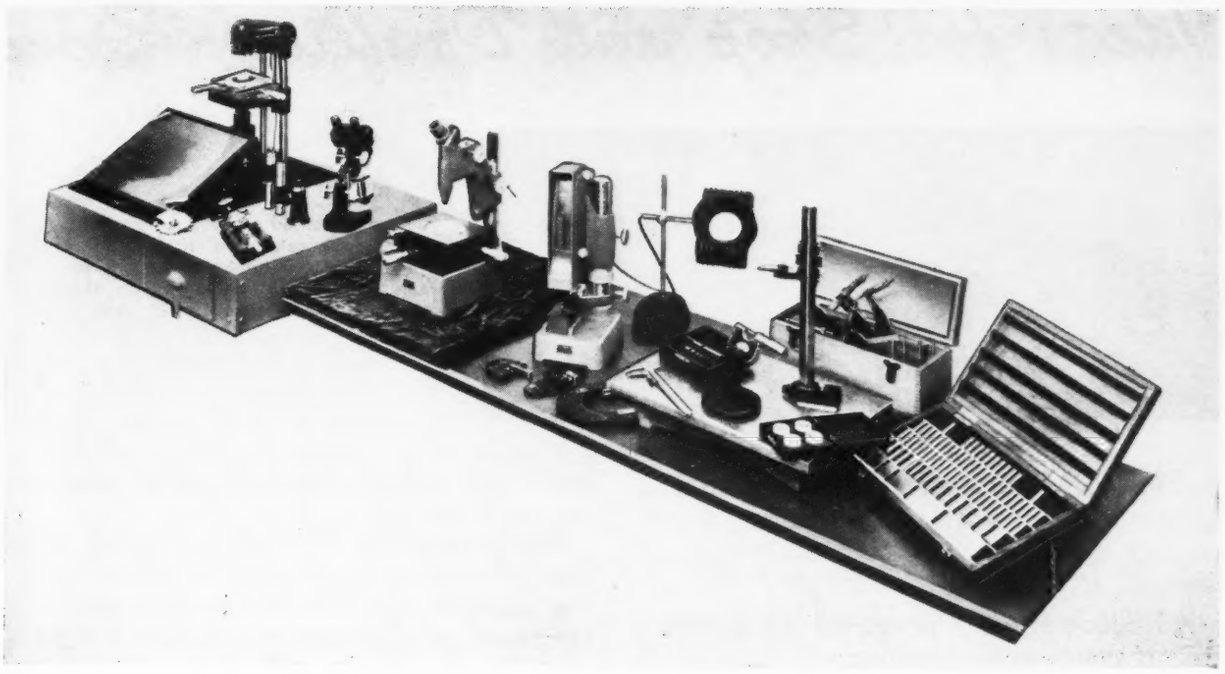
The jig body can be made from octagonal stock or from square stock with four flats machined on its periphery to form the necessary supporting surfaces for the jig when drilling the eight holes. One end of the body is bored to a diameter large enough to clear the head of the work-piece. The bottom of this hole is finished to provide a flat, square seat for the head end of the bushing to be drilled. A wide under-cut is also machined at the bottom of the hole to prevent chips from collecting under the end of the work. Two large slots are provided in the body, as shown, for the removal of chips from the hole.

Eight equally spaced radial holes are bored in the jig body, with their centers accurately located from the bottom of the work-clearance hole. Bushings for guiding the drills are pressed into the radial holes. This end of the body is made as short as possible, while still retaining sufficient stock to prevent the bushings from working loose. In this way, the work is allowed to project beyond the body to facilitate its removal from the jig after drilling.

A hardened and ground locating plug, the periphery of which provides a sliding fit for the bore of the work-piece, is pressed into the body at the bottom of the clearance hole. The nose of this short plug is chamfered to facilitate loading



Simple, quick-acting jig employed for drilling eight equally spaced radial holes near one end of a spring-cage bushing



of the work. Projecting through, and keyed to the locating plug, is a long stud in which a recess is machined near the right-hand end to provide a seat for the knurled C-washer. A hand-knob is screwed on the locating plug.

After the C-washer has been slipped on the stud, the hand-knob is rotated until the work is firmly clamped between the bottom of the clearance hole and the inner face of the washer. At the completion of the drilling operation, the hand-knob is loosened, the washer is taken off, and the work is removed from the jig by pulling on its projecting end. If the part is difficult to remove, the stud can be pulled from the locating plug and pressure applied to the bottom of the work-piece by inserting a brass rod through the plug.

* * *

Collegiate Winners of Welding Award

Winners of the 1951 A. F. Davis Undergraduate Welding Award announced by the American Welding Society were Edwin L. Marshall of New York University, New York City, who won the first prize of $200, and Stan Spaulding, Purdue University, Lafayette, Ind., who received the second prize of $150. Titles of the winning papers were "Arc-Welded Tractor" and "Analysis and Design of Welded Pressure Vessels," respectively. The journals publishing the papers—the *N.Y.U. Quadrangle* and the *Purdue Engineer* — were given $200 and $150, respectively. The Award is sponsored by A. F. Davis, vice-president and secretary of the Lincoln Electric Co.

Scherr Inspection Measuring and Testing Equipment

An assortment of measuring tools and instruments designated the "Scherr Limited Budget Laboratory" has recently been assembled by the George Scherr Co., 200 Lafayette St., New York 12, N. Y., to conform with the new government regulations for the inspection of rearmament and defense work.

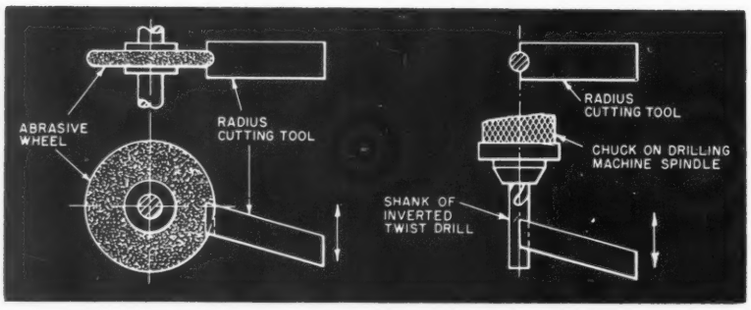
This equipment is capable of performing all ordinary operations required in measuring and inspecting precision machine work. It includes instruments and measuring devices for checking thickness, length, diameter, and contours of tools. Templates and dies, and pitch, lead, and form of screw threads can be accurately checked, as can also circular divisions and graduations. A binocular three-dimensional microscope is provided for the inspection of surface finish. Height gages are available in sizes of from 12 to 48 inches.

* * *

Power Tool Manufacturers Organize

Representatives of power tool manufacturers met in Washington, D. C., last August to form an association known as the Power Tool Manufacturers' Association, with headquarters at 732 Dupont Circle Bldg., Washington 6, D. C. Myron H. Buehrer, vice-president and general manager of the Boice-Crane Co., Toledo, Ohio, was elected president of the Association, and Herbert Upton, president of the Double A Products Co., Manchester, Mich., vice-president.

Ideas for Shop and Drafting-Room



A simple method of producing radius cutting tools consists of first grinding the tool to approximately the desired radius, and then lapping it on the shank of an inverted twist drill

Simple Method of Producing Small Radius Cutting Tools

By EDWIN N. OLSON, Bellflower, Calif.

A simple method of producing radius cutting tools is shown in the accompanying illustration. First, an abrasive wheel is shaped as accurately as possible to the required radius by means of an abrasive stick or stone. The desired profile is then ground on the radius cutting tool, as seen at the left. Clearance for the cutting edge is obtained by holding the tool at a slight angle while it is raised and lowered past the horizontal center line of the grinding wheel.

A straight-shank twist drill having a shank diameter equal to twice that of the desired radius is inverted and placed in a drill chuck, as seen at the right in the illustration. Then, by applying lapping compound to the shank and pressing the ground tool against the revolving drill, the cutting edge is lapped to the radius required. The only subsequent operation that is necessary before the tool is placed in service is to stone its top surface.

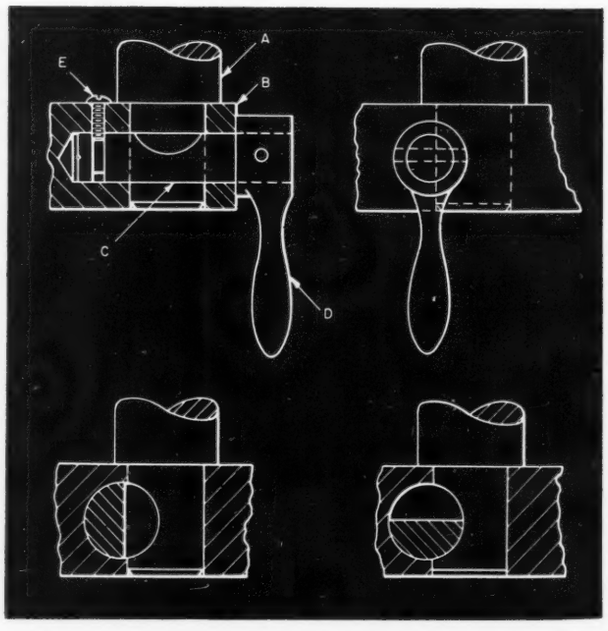
Quick-Acting Locking Shaft for Guide Rails

By L. KASPER, Philadelphia, Pa.

On a special polishing machine, a guide rail supported on an upright bar required frequent removal for adjustments. It was necessary that the guide rail be rigidly supported, accurately positioned, and easily removable. The illustration shows how the upright rails were supported and locked. At the top are two views of the assembly with the guide rail in the locked position. The upright rail bar is shown at *A*, the supporting member at *B*, the locking shaft at *C*, the operating handle at *D*, and the retaining screw at *E*, which engages an annular groove in the end of shaft *C*.

The cross-section views at the bottom of the illustration show the operation of this assembly. The shank of bar *A*, which fits into part *B*, is machined perpendicular to its axis to form a semi-circular recess equal in diameter to the diameter of shaft *C*. Shaft *C* is similarly machined to conform to an arc of a circle that is equal in diameter to the diameter of the shank of bar *A*.

The left-hand cross-section view shows the assembly in the unlocked position, so that bar *A* may be withdrawn from part *B*. In the right-hand view, shaft *C* has been rotated by means of handle *D* so as to engage the semicircular groove in shaft *A*. The center of the groove in shaft *A* is slightly above the center of the locking shaft *C*, so that when shaft *C* is rotated, shaft *A* will be drawn down tightly on its shoulder.



Positive locking device designed to permit quick removal of the upright guide rail (A)

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Fatigue Strength of Cast Steel

S. B. M.—A cast steel containing around 0.20 per cent carbon and 2.25 per cent nickel has been recommended to us for the manufacture of certain parts. What information have you on fatigue endurance limits of this steel?

Answered by the Editor, "Nickel Topics," Published by International Nickel Co., Inc., New York City

The fatigue limit of this steel, which is generally normalized and tempered, may be considered to be around 55 per cent of the ultimate tensile strength. The general rule in estimating endurance limits is to take a value of half the tensile strength. (Such figures apply only to polished specimens in machines of the R. R. Moore rotating beam type.) The nickel steels give a slightly higher ratio than the normal 50 per cent because of the strengthening effect of nickel on the ferritic matrix.

Since stress concentration tends to occur in most engineering structures, and since rough surfaces, tool marks, decarburization, scale, and other surface defects are fairly prevalent, the polished specimen endurance limit is not a very significant value for designers. Hence, laboratory data on fatigue are not safe guides for engineering design unless correction factors are known and can be applied.

Modifying a Sales Contract

A. K. W.—We sold machinery with a printed clause in the sales contract explaining in detail the guarantee. The sales contract was modified with a hand-written sentence, stating that we would not be responsible for damages caused by failure of the machine to produce satisfactory results. Now the purchaser is suing us for damages, contending that the machine does not perform according to the printed guarantee. Can you assist us to win this suit?

Answered by Leo T. Parker, Attorney at Law Cincinnati, Ohio

All courts agree that a purchaser may include in a contract any restriction on a seller, and if no law is violated, the restriction is valid and binding on the seller. Also a seller may limit his liability in a hand-written clause and completely avoid any damages resulting to the purchaser, even though the printed guarantee is breached.

For example, in Mortin vs. Southern Engine and Pump Co. [120 S. W. (2d) 1065], it was shown that the seller of a machine inserted in the printed contract a pen-written clause stating that he would not be responsible for damages caused by the use of the machine. However, a printed clause in the contract stated that the machine was guaranteed to perform certain work. The purchaser sued the seller and proved that this guarantee was breached. The purchaser asked the Court to allow damages that he suffered through lost time and money while endeavoring to use the machine. The higher Court refused to award any damages, saying: "It is well settled that parties to such a contract of sale may provide for a limitation of damages in case the seller breaches his warranty." Hence, the seller's pen-written guarantee limitation clause had priority over his printed guarantee clause.

Also, in Wilson [256 N. Y. 93], it was shown that a seller printed on the contract the following: "We give no warranty, express or implied, as to description, quality, . . . or any other matter, of any merchandise sent out, and will be in no way responsible." In relieving the seller of the guarantee, the Court said that neither party was obliged to enter into the contract, and there is no law that prevents persons of sound mind making such agreements.

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Society of Women Engineers Publishes New Journal

Announcement has been made of the first issue of a new official publication of the Society of Women Engineers, Philadelphia, Pa. The Journal, a 16-page quarterly, will report on the activities of members of the Society and its sections, and will carry articles and news of general engineering interest. Among the subjects discussed in the first issue was the effect of the current emergency on women in engineering.

Constructing Arcs Tangent to Circles

By PAUL GRODZINSKI

In the November, 1950, number of MACHINERY, page 185, W. W. Quist described a solution to the problem of constructing arcs tangent to circles when the radii R_1 and R_2 of two circles and the radius r of the tangent arc are known. However, it frequently happens that the radius r is not accurately known, and the problem confronting the designer is in locating the center of the arc tangent to two circles whose positions and sizes are known. A method of determining the loci of all the centers of arcs tangent to two circles will be described here.

As may be seen in the accompanying illustration, the centers of all circles that are tangent to the outside of the given circles having radii R_1 and R_2 lie on a hyperbola, because if P_1 is the point of tangency with a circle having a radius of R_1 and P_2 is the point of tangency with a circle having a radius of R_2, then

$$xP_1 = xP_2 = r$$

and

$$xO_2 - xO_1 = (r - R_2) - (r - R_1) = R_1 - R_2 = \text{constant}$$

The construction of the hyperbola is not difficult. With circles of given radii R_1 and R_2, draw circle T tangent to these circles as shown, using x as the center. Then draw circle S through O_1 and O_2, with y as the center. Construct a line CD perpendicular to AB through x, intersecting circle S at points C and D. This supplies the asymptotes and the values a and b. From these, graphically or by calculation, we obtain $p = \frac{b^2}{a}$, this being the ordinate through O_1 and also the radius of curvature of hyperbola near x.

The hyperbola divides the distance P_1P_2 in half, and the center of the hyperbola, or the intersection point of the asymptotes, divides the distance O_1O_2 in half, with $O_1y = O_2y = \sqrt{a^2 + b^2}$, a and b being the usual parameter of the hyperbola. Inside the circle T, the hyperbola may be replaced by the radius p; outside the circle, it approaches the asymptotes, and may be replaced by a slightly curved line approaching the asymptotes.

If one point of the hyperbola, other than x, is known (for instance P'), other points are easily constructed with the help of the asymptotes. Any ray through P' intersects the asymptote branches as at E and F. Thus $EP' = FP''$, with P'' another point of the hyperbola. Many other rays can be drawn through P' to find new points. It might be mentioned that the other branch of the hyperbola going through z is valid for all circles tangent to the inside circles of radii R_1 and R_2.

The other contact problems as sketched by W. W. Quist lead to ellipses, as well as hyperbolas; owing to the better known construction of the former curves, these are not discussed in detail.

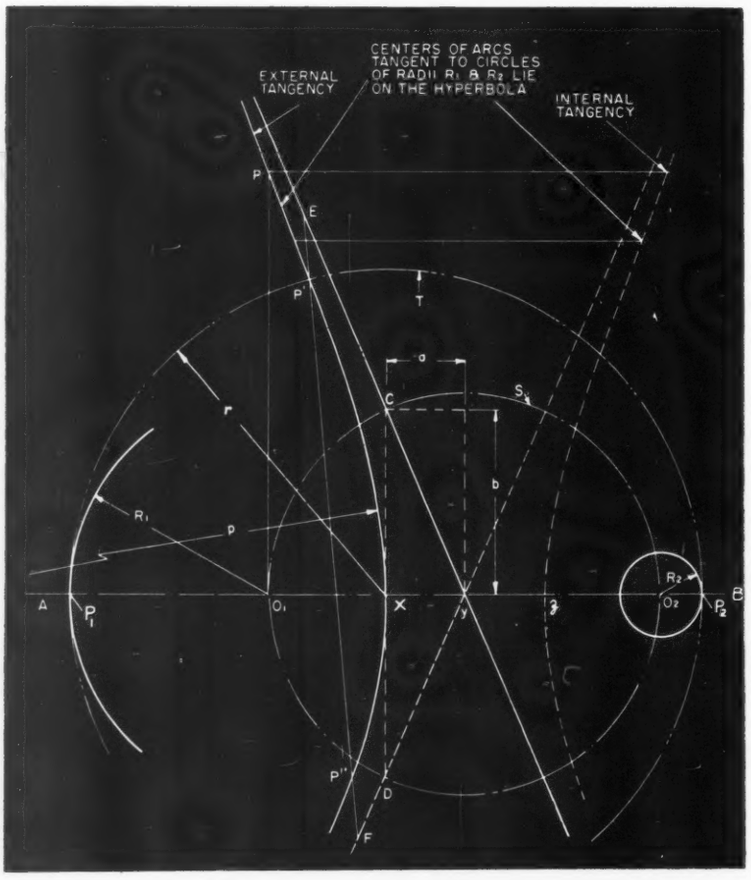


Diagram showing a method of constructing a hyperbola for determining the loci of centers of arcs tangent to two circles

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

Silence and The Sales Interview

WHAT buyers complain about most in salesmen is constant chatter. A prominent columnist writing on social problems once received a letter from a girl in distress. "I am deeply in love with a nice young man," she wrote, "but I have false teeth, and he doesn't know it. Should I tell him now and risk a broken engagement or marry him and suffer the consequences later?" The columnist answered, "Marry the man and keep your mouth shut."

Complete silence is as worthless as a constant gush of words. What we most need is "talk control," just as in any machine we require "torque control" in the driving mechanism. If the control contacts get mixed up, the whole sequence of motions is thrown out of kilter.

By studying how much we say—the extent to which we utter words—in addition to what we say, and how we say it, many of us can strengthen our sales story. "Repetition is reputation," the advertising expert tells us, but in vocal expression, constant repetition becomes wearisome and may lose emphasis.

Every day many thousands of sales interviews take place between those who sell machinery and those who buy it. These interviews represent an enormous investment in effort and time. On the way we shape them depends millions of dollars worth of business, either lost or won.

From a consistent, practical study of a large number of sales interviews, we can choose the following typical examples of lack of "talk control." They may be so obvious that we even disregard their importance.

A buyer offers an objection. We breathlessly refute it. Whereupon the buyer offers another objection, and then still another, shifting his position as he proceeds. If we can delay answering each objection until we have the buyer committed to all his objections—build a fence around them—we are in a much better position to take the lead and refute one and all. We strategically limit the area for sales argument and cut out unnecessary words.

Another salesman with a strong urge to talk leaps into the sales interview by focussing his appeal upon one important selling point of his equipment. The buyer listens, but soon his interest flags. "I know all that," finally says the buyer—"know all about your automatic control. But what interests me are limits and tolerances." Plainly, the salesman in his anxiety to talk has picked the wrong track, thereby weakening his position by unnecessary talk.

Commonly, an inexperienced salesman, when faced with a buyer's problem, resorts to an abundance of words—in an attempt both to satisfy the buyer and to get his mind off the subject in hand. He tries to substitute chatter for relevant, definite statements. Like as not, he simply can't answer the question—doesn't know the answer. He hopes to throw up a smokescreen to shut out that vital part of the buyer's picture. It's better to be frank. Admit our ignorance and say we will immediately find out. Then deliver the answer.

Again, we may face a shop official or workman with an operating difficulty in his mind. We attempt the "psychological treatment." We assume his troubles are imaginary, and try to sell the prospect from this point of view. Thus we try to substitute talk for action. If we were wise, we would listen carefully to his difficulty, and then try to analyse it. Many times by assuming that the objections are real and worthy of investigation, we find that the trouble is not with the machine or its application. The shop man may have to be re-sold, not by a string of words, but by a demonstration of the use of the particular machine.

Numerous cases are on record in which the salesman gets turned down because he fails to recognize that the prospect has something important on his mind at the time of the interview. In the pressure of the moment, the prospect may be faced with a problem that needs his complete attention. He is irritated by a blast of sales talk. He immediately wants to get rid of us. Better to make the appeal or question direct and short. It must be concise and pertinent. We might request a future more convenient appointment.

Buyers of equipment agree that the most acceptable salesman is one who doesn't say too much. He has a friendly, quiet, earnest, and informative approach. He uses silence. He weighs carefully the prospect's remarks, and then at the right time, he speaks with authority based on knowledge. He controls his talk to fit in with the opportunity offered.

* * *

Honing Main Bearings of Cylinder Blocks to Insure Precise Alignment

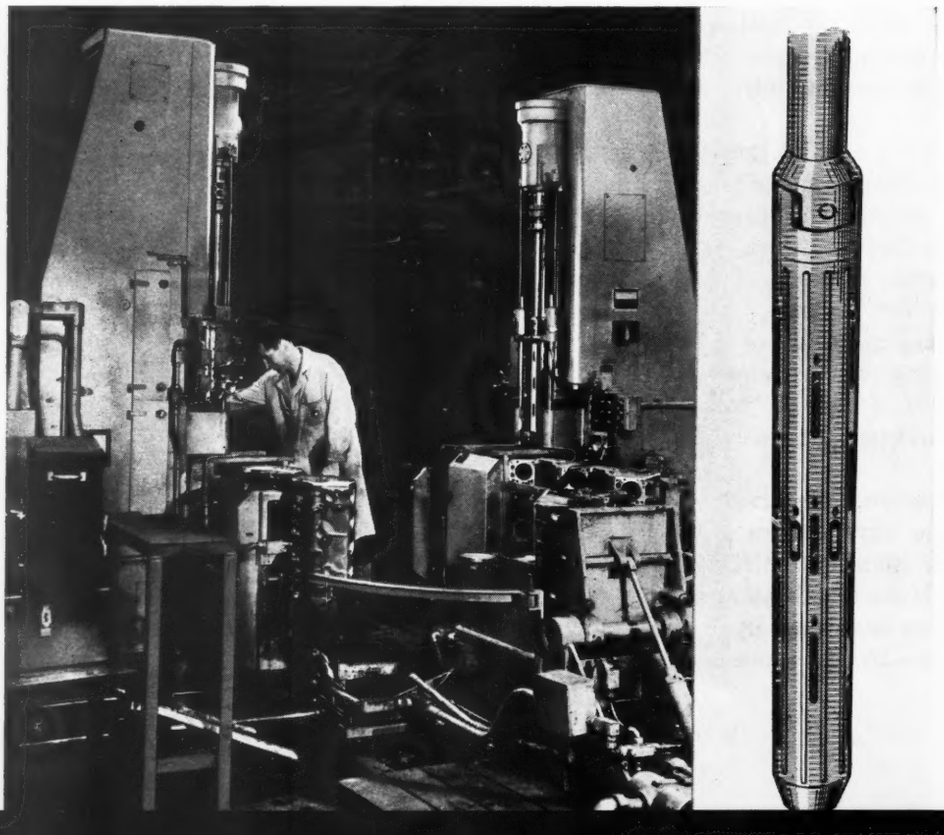
New guided type tools and automatic machines developed by the Micromatic Hone Corporation, Detroit, Mich., are being used to advantage for the production honing of the main bearings in automobile-engine cylinder blocks. This equipment is said to hold the alignment, size, roundness, and straightness of the bores to a total tolerance of 0.0005 inch.

In one of the major automobile manufacturing plants, this equipment is now honing the main bearings in V-8 cylinder blocks at the rate of over sixty blocks per hour, all bearings being held in accurate alignment within 0.0002 inch. The operation is entirely automatic. The two columns of the "Hydrohoners" are set facing each other in the conveyor line, as shown in the accompanying illustration. The blocks are taken from the line, automatically tipped up on end, and transferred to the fixture of either column.

Automatic "Microsize" equipment controls the honing cycle for each block, and indicates which column is to receive the block from the line. As the block is finished, it is indexed onto a tilting table, from which it returns to the conveyor line. An indicator shows the amount of wear on the stone or hone, and thus enables the operator to determine when the abrasive hones should be changed.

Alignment is assured by the special guided honing tool seen at the right of the illustration. This tool has one bank of abrasives and seven banks of plastic guides. The same abrasives "stroke" or pass through all the bearings, thus making certain that they are honed to a uniform size. The guides are spaced so that they stabilize the tool as the abrasives pass from bearing to bearing. The guides are forced out radially by the same cone (wedge) that applies pressure to the abrasives. The plastic, wearing down with the abrasives, maintains a large area of contact with the bearing surfaces and keeps the tool on a true center line at all times.

One operator attends both machines, spot checking the bearings with an air gage having a single mandrel with five air orifices. All five bearings are gaged simultaneously.



(Left) "Hydrohoners" built and equipped with improved hones by the Micromatic Hone Corporation for production honing of the main bearings of cylinder blocks. (Right) Guided type hone used in machines shown at left to assure accurately sized and aligned bearings

Erik Oberg, Former Editor of MACHINERY

ERIK OBERG, for forty-six years on the editorial staff of MACHINERY, and widely known throughout the machine tool and metalworking industries of America and Europe, was killed by an automobile in Rockford, Ill., on October 22. Mr. Oberg had just completed a call on the Rockford Machine Tool Co. and was struck by a speeding automobile as he returned to his car.

Born in Vernamo, Sweden, in 1881, Erik Oberg was a graduate of the Government's Technical College of Boras, Sweden. Upon concluding a term of apprenticeship with the Atlas Works, Stockholm, Sweden, he secured a position with the Bolinders' Mechanical Works of Stockholm. He then came to this country, where he was first employed by the Cincinnati Milling Machine Co., Cincinnati, Ohio, and later by the Pratt & Whiney Co., Hartford, Conn., in the capacities of draftsman and designer, his specialty being machine tools, automatic machinery, jigs and fixtures.

Mr. Oberg became an associate editor of MACHINERY in 1906, and was active on the editorial staff for forty years. While associate editor he edited MACHINERY'S Reference Series, wrote a number of technical books, and was the co-author of MACHINERY'S HANDBOOK and MACHINERY'S ENCYCLOPEDIA. He became Editor in 1918 and occupied that position for more than twenty-eight years, resigning in 1946. In the last five years he served as consulting editor. During his work as Editor, he won distinction in engineering circles, having been active in the American Society of Mechanical Engineers, of which he was treasurer for ten years. He was also a member of various important committees of that Society. In the first World War, Mr. Oberg was a member of the Committee for Adjusting the Industries to War Work appointed by the Government. During World War II, he served a period with the War Department as consultant to the Army Air Forces. He was also vice-chairman of the Manufacturing Engineering Committee of the American Society of Mechanical Engineers, working under the auspices of the War Production Board.

Surviving are his widow, Mrs. Helena E. Oberg; a son, Henry V. Oberg, of Cleveland, Ohio; and a step-son, Wilbert A. Mitchell, of Springfield, Vt.

Mr. Oberg was greatly admired by all who knew him for his high integrity, great industry, strong personality, and extensive engineering knowledge. He will be deeply missed by all of his associates on MACHINERY and his many friends throughout industry.

LATEST DEVELOPMENTS IN *Shop*

Giant Automatic Turret Lathe Announced by Potter & Johnston

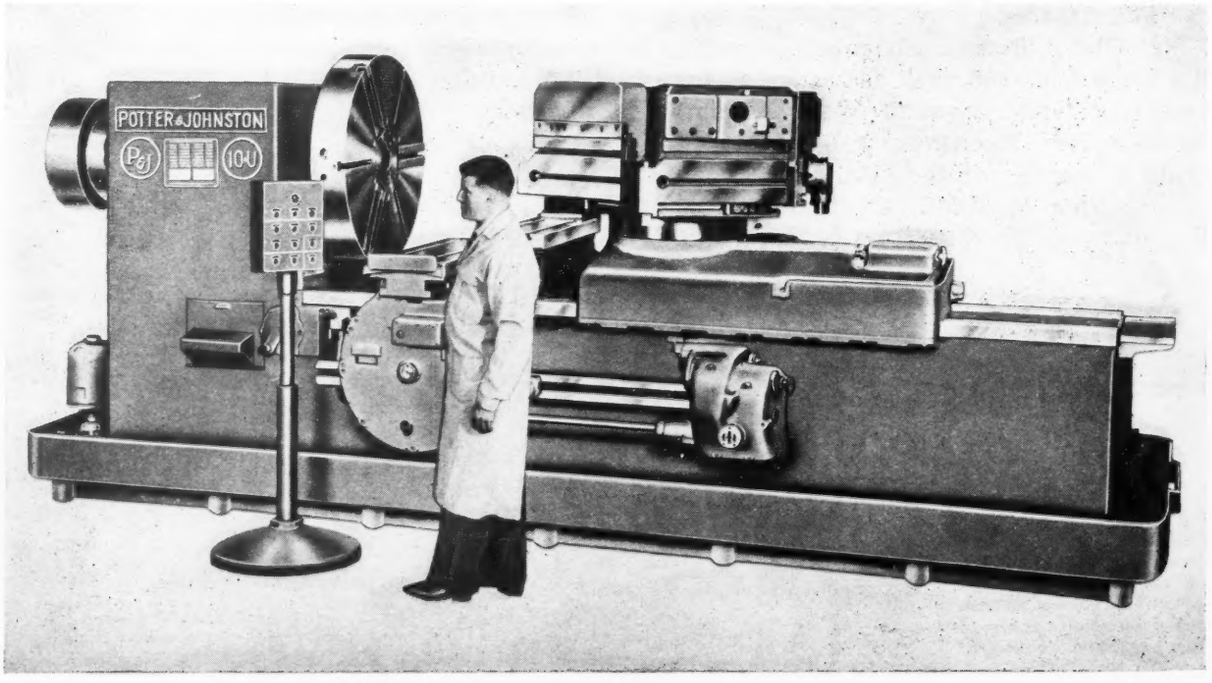
The latest addition to the line of automatic turret lathes built by the Potter & Johnston Co., Pawtucket, R. I., is a giant size Model 10-U machine, designed to handle large, heavy work. This machine will swing work up to 49 inches in diameter over the base ways. The swing capacity of the machine over the cross-slides permits chucking work up to 36 inches in diameter and machining pieces up to 27 inches in diameter.

Individual front and rear cross-slides, operating from separate timing boxes, can be controlled independently or simultaneously with the movement of the turret-slide. A 25 1/2-inch adjustment along the bonded tool-steel base ways permits tools on the front and rear cross-slides to be positioned so as to work from the rear and on the face of the work-piece at the same time that the turret tools are operating. The travel of the cross-slides is fixed at 8 1/2 inches. This flexibility of tooling has been developed to speed up production on a wide range of precision work and to materially reduce machining costs.

The minimum distance from spindle to turret is 30 inches, and the maximum distance, 50 inches. The distance, center to center, between the 5-inch wide base ways is 31 inches. There are four automatic changes of spindle speed and three automatic changes of feed which are readily available for each set of pick-off gears.

Because the starting and stopping of large motors on big machines place a very heavy load across the line, the new automatic turret lathe is equipped with a 75-H.P. multi V-belt drive and a large magnetic clutch and brake. In operation, the main motor runs continuously; the spindle is started, stopped, and jogged by the clutch and brake at the motor. With this arrangement, high current inrushes are confined to initial starting and shut-down.

The lathe equipment includes full electro-pneumatic control hardened and ground speed gears, an air-operated chuck, and a centralized control station for operating the air chuck and all machine functions. 68



Automatic turret lathe developed by the Potter & Johnston Co. to handle extra large precision work

To obtain additional information on equipment described here, use Inquiry Card on page 229.

Equipment

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on Market

Edited by FREEMAN C. DUSTON

Norton Special Universal Grinding Machine

A new special grinding machine of the heavy production type with universal features designed for grinding jet-engine components has been brought out by the Norton Co., Worcester, Mass. This 42- by 72-inch machine is massively proportioned throughout to provide extreme stability under the heaviest production demands. The wheel-slide takes a grinding wheel 30 inches in diameter which can be swiveled 180 degrees by power, thus permitting rapid angular setting of the wheel for specific operations. The wheel-slide is clamped hydraulically and is operated automatically through an interlock on the swivel motor switch.

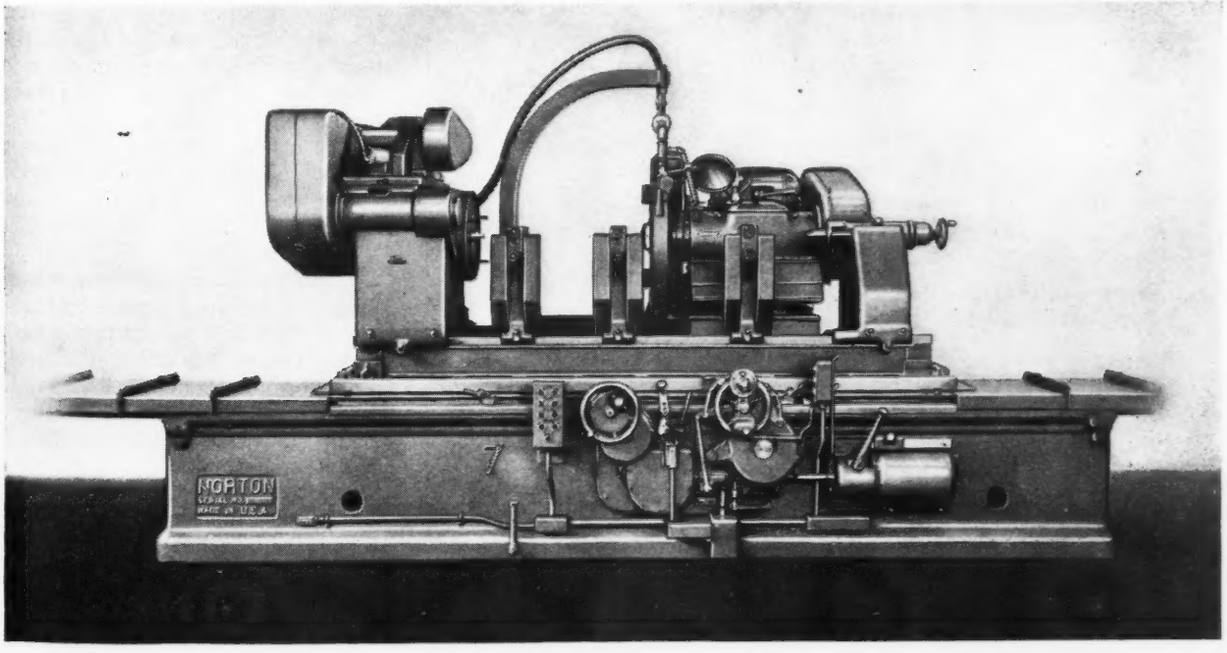
Work 42 inches in diameter can be readily ground with the full size 30-inch diameter wheel. The wheel can be moved rapidly toward or away from the workpiece by a power mechanism, which is operated by a small lever, and can be stopped at any point in its travel when being positioned by power.

The wheel-spindle unit has long, full bearings which enclose a major portion of the spindle body, providing exceptionally high resistance to deflection by wheel pressures. An index on the wheel-feed handwheel makes possible settings in work diameter reduction as fine as 0.0001 inch. Power wheel feed at table reversals is automatic and adjustable for any desired amount of feed.

A sliding table mounted on widely spaced ways supports a swivel-table for grinding taper work. Both tables are ribbed heavily. The top of the swivel-table slants toward the grinding wheel. This design lends maximum strength, the best coolant drainage condition, and an ideal clamping and aligning surface to the headstock, footstock, and table attachments. 69

New Type G-E Starter for Arc-Welders

A new type starter, which is basically a fused high-capacity interrupter switch, is now being used on all production models of the WD Types 42, 43, and 44 motor-generator direct-current arc-welders made by the General Electric Co., Schenectady, N. Y. This starter



Special machine for grinding jet-engine parts brought out by the Norton Co.

To obtain additional information on equipment described here, use Inquiry Card on page 229.

is said to provide positive motor starting because the contacts are locked in by mechanical action. A direct-acting lever physically closes or opens the contact when it is operated, affording direct control over starting and stopping. This reduces maintenance by eliminating intermediate devices. It is also said to reduce pitting and erosion on contact tips by eliminating chattering or misstarts.

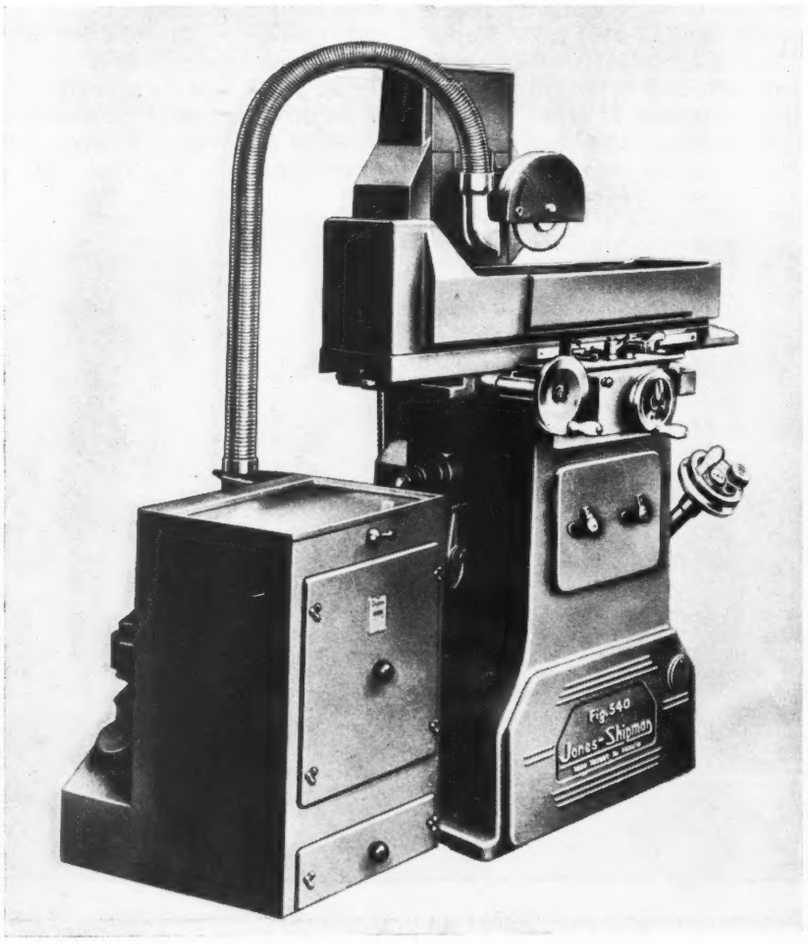
A time-delay fuse connected directly in the line protects the motor circuit from overload. This feature enables the fuse to carry harmless overloads and starting circuit in-rushes, as well as provide motor-running and branch circuit over-current protection. 70

Jones & Shipman Hydraulic Surface Grinder

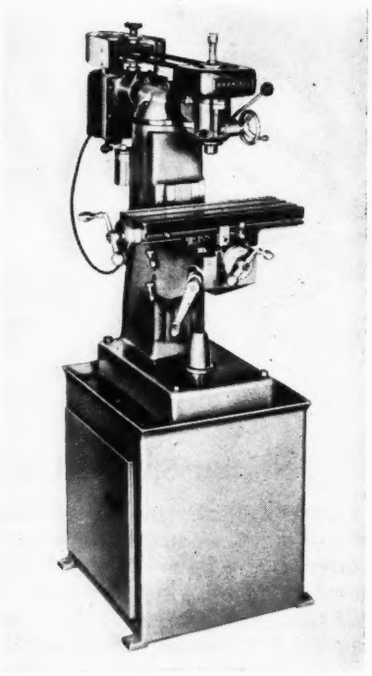
The British Industries Corporation, New York City, is introducing in the United States a hydraulic surface grinder made by Jones & Shipman, Leicester, England. This Type 540 precision surface grinder has completely centralized controls.

The handwheel for making vertical adjustments of the wheelhead has 0.0001-inch divisions, and a fine adjustment for the vertical feed of the wheel in 0.0001-inch increments is available. The wheel-head spindle runs in plain journal and thrust bearings, and is hardened, ground, and tapered at the front end to receive the grinding wheel flange plates. The bearings are diamond-bored, and the spindles are ground and superfinished to within 2 micro-inches r.m.s. The drive to the spindle is provided by a 1-H.P. constant-speed motor.

The wheel-head slide operates on preloaded ball-bearing rollers, which run on precision-ground bar guides. This feature provides the necessary rigidity for the wheelhead in all positions of its vertical traverse, and permits extremely sensitive control of the wheel feed. The table traverse is arranged for both hydraulic and hand operation. The hydraulic system operates at a maximum pressure of 120 pounds. 71



Jones & Shipman hydraulic surface grinder placed on the market by the British Industries Corporation



Vertical milling machine introduced by Johansson & Windle Co.

Johansson Vertical Milling Machine

A vertical milling machine designed to handle accurate work and provide rigidity, flexibility, and a wide range of operation has been introduced by the Johansson & Windle Co., Skokie, Ill. All feedscrews of this machine are precision-ground and mounted in preloaded ball bearings. Large dials, 3 3/16 inches in diameter, are graduated into 100 increments. The dials are plated wth a satin finish, and all other parts subject to corrosion or tarnish are either plated or black oxided.

The machine includes a milling unit which provides spindle speeds (with a 1725-R.P.M. motor) of 180 to 1000, 350 to 1900, and 600 to 3250 R.P.M. Quill travel is 2 1/16 inches. Handle and wheel feeds are provided for drilling and boring operations. Additional features include a positive quill lock and micrometer depth stop graduated in thousandths of an inch. Either a No. 7 B & S or a No. 2 Morse taper spindle can be provided, as required.

The machine has a longitudinal feed of 12 inches; cross-feed of 4 1/4 inches; vertical feed for

knee of 12 inches; maximum distance from spindle to table of 12 inches; minimum distance of spindle to table of 0 inches; and maximum distance of spindle to column of 8 3/4 inches. The table is 6 by 18 inches in size. The machine has a height of 60 inches, weighs about 600 pounds and requires a floor area of about 35 by 38 inches. 72

DoAll Band Machine with Wide Speed Range

The DoAll Co., Des Plaines, Ill., has added to its line a new general-purpose contour sawing machine that takes endless or continuous saw, file, or abrasive bands up to 1/2 inch in width. This machine—the V-36-3—has a three-speed transmission and Speedmaster drive, which provides band speeds ranging from 25 to 6000 feet per minute. With this speed range, it will perform all types of conventional metal sawing or filing, high-speed cutting of non-ferrous metal and composition materials, and friction cutting of light-gage alloys.

The machine has a relatively light welded steel frame, 81 inches high, which requires a floor space of only 40 by 76 inches. It is particularly useful in aircraft production, and sheet-metal and pattern shop work, where its 36-inch throat capacity is advantageous. This model normally carries the saw band over three wheels, but when the band becomes too short after several welds, it can still be used over two wheels on work requiring no more than a 16-inch throat capacity. The machine is driven by a 3-H.P. motor, with push-button control. 73

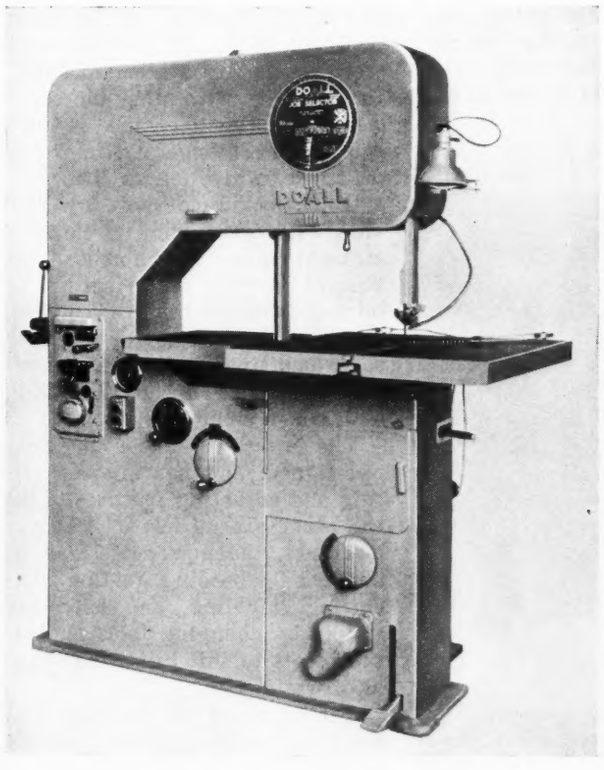
Cleveland Compound-Table Tapping Machine

To facilitate precision tapping of a number of holes of the same size on one or more levels in bulky pieces where use of multiple tapping heads is impracticable, the Cleveland Tapping Machine Co., Canton, Ohio, has brought out a compound-table tapping machine. The 28- by 42-inch work-table of the new Type ER machine moves freely on ball-bearing raceways, and has a travel of 20 inches to either side, 13 inches forward, and 11 inches backward. This makes it possible to center any hole in a 24- by 40-inch work-piece directly under the tap.

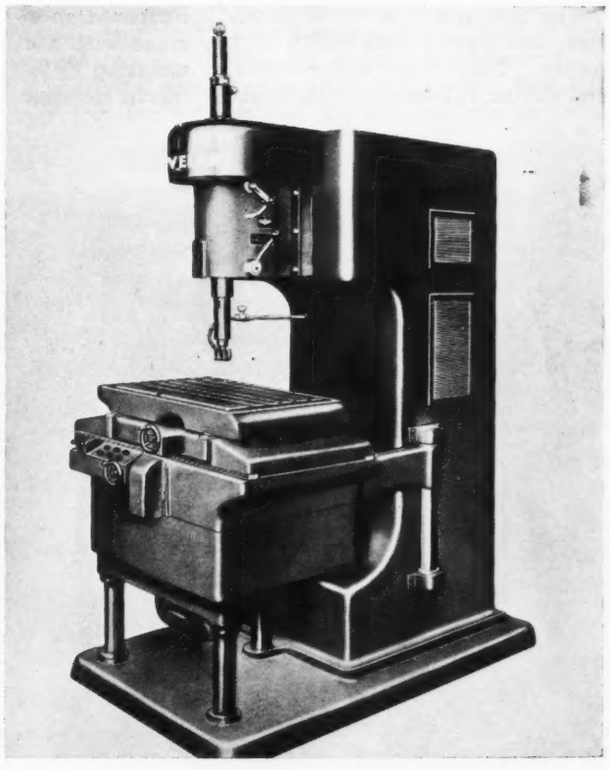
A push-button controlled solenoid brake locks the table in any position and holds it until released. The solenoid is designed to prevent overheating, regardless of the length of time the brake is applied. A motor-operated raising and lowering system, controlled by levers, gives the table a vertical travel of 18 inches, the top being 56 inches from the floor at maximum height. The three-point mounting of the table insures accurate leveling at any point in its vertical travel.

The machine has a standard Type E Cleveland head with hardened tool-steel lead-screws and split bronze lead-screw nuts to insure maximum precision in high-speed tapping. Provision is made for either manual or automatic cycling, and limit switches are provided for tapping blind holes. The stroke is adjustable up to 5 inches. The motor-operated positive coolant and lubricant system has a capacity of 8 gallons.

The base of the machine is 64 inches long by 38 inches deep. The column is 25 to 20 inches, and is approximately 100 inches high. A throat depth of 26 1/2 inches per-



General-purpose contour sawing machine recently added to the line of the DoAll Co.



Cleveland tapping machine with compound table mounted on ball-bearing raceways

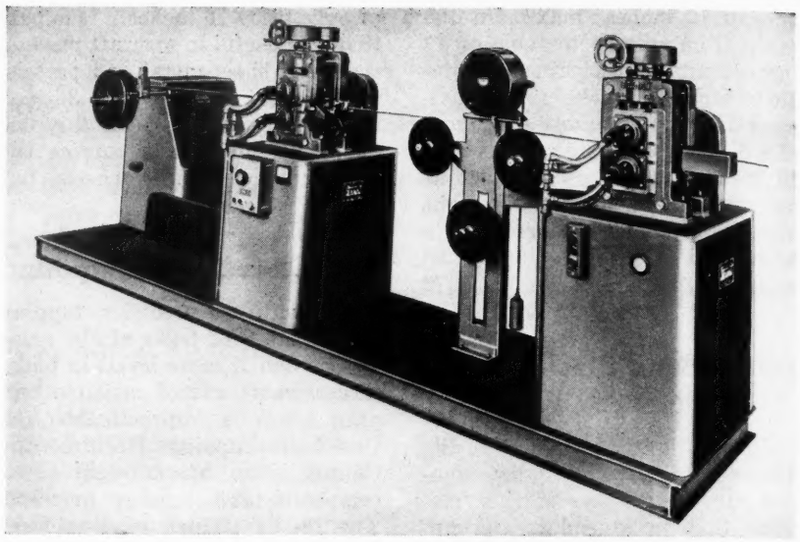
To obtain additional information on equipment described here, use Inquiry Card on page 229.

mits handling work-pieces that extend beyond the back of the table. The top of the table is precision-machined, and provided with four T-slots for mounting jigs, fixtures, and clamps. The new machines are manufactured in a number of sizes for tapping National Coarse threads in mild steel in sizes from 3/8 inch to 2 3/4 inches. 74

Stanat Wire Rolling Machine

The Stanat Mfg. Co., Long Island City, N. Y., is manufacturing a high-speed, low-cost, two-stand wire rolling mill designed to flatten round and other types of wire. The machine is easy to set up for short or production runs, and operates on a variable-voltage principle. The two motors receive their power from a single generator, which operates from an alternating-current source. The generator and controls are housed in a single unit, which may be placed adjacent to or some distance from the machine. A manually operated rheostat, located on the second mill, accelerates and decelerates both motors simultaneously, synchronization being accomplished by a "dancer roll" rheostat.

The rolls are 6 inches in diameter, and have a face width of 4 inches. They are water-cooled, and run on full-length roller bearings with separate thrust bearings. Adjustment is by means of hardened and ground feed-screws, which are connected to the single handwheel through worm-gearing. A simple compensating device provides adjustments for roll parallelism. Edging rolls run on tapered roller bearings, and are provided with a quick release handle to facilitate the threading of the wire. The complete machine occupies a floor space of approximately 5 by 15 feet. 75



Stanat rolling machine for flattening round and other types of wire

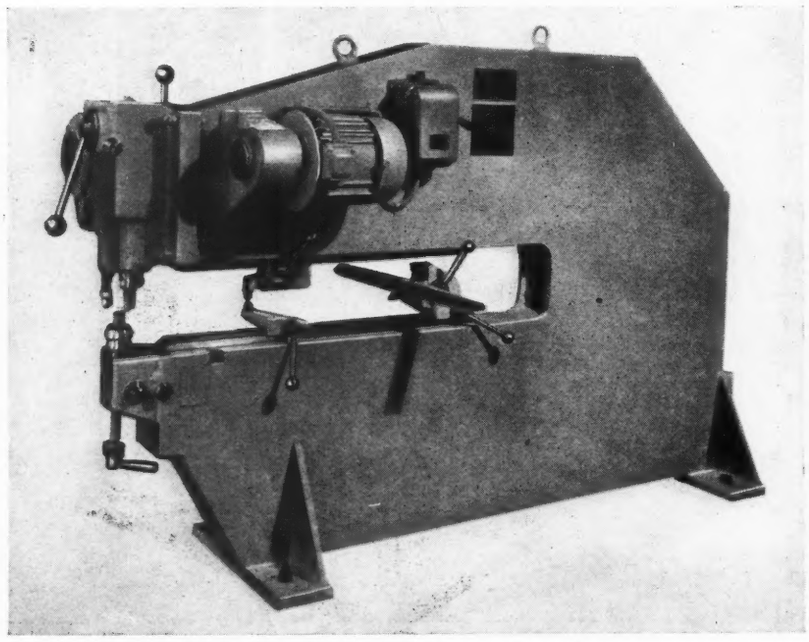
Improved Pullmax Sheet-Metal Cutting Machine with Increased Throat Depth

The American Pullmax Co., Inc., Chicago, Ill., has brought out an improved sheet-metal cutting machine with a capacity for cutting metal up to 9/32 inch thick. The throat clearance of the new Model D-3 machine has been increased to facilitate inserting and handling bulky material, and the throat depth of 48 inches enables large steel sheets to be accommodated. In keeping with the increased clearance, the machine is now equipped with longer cutting tools, designed to give longer life.

Quick locking devices are provided for both the circle and straight cutting attachments. This feature permits faster set-up, as no tools or wrenches are required. The setting-up time for circle or square cutting work is also speeded by the new lower guide rail, which is graduated in inches.

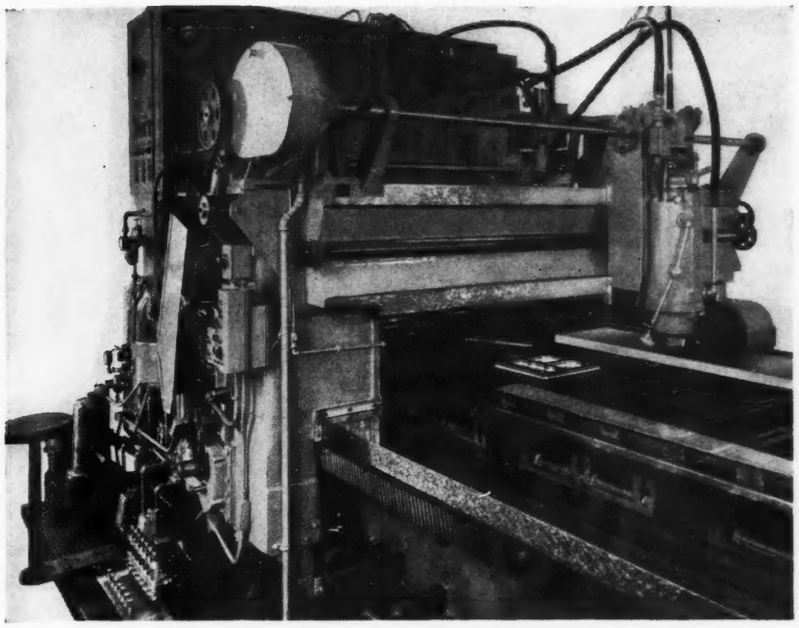
The lower tool-holder has been redesigned, and has simpler setting and adjusting features. Like the other six models of Pullmax machines, the new model can be adapted for beading, folding, slot-cutting, nibbling, and louvering simply by changing tools and attachments to suit this wide range of operations.

The frame of the machine is of box type construction, and is made of welded steel plate. All moving parts are enclosed and operate in an oil bath. 76



Improved metal-cutting machine placed on the market by the American Pullmax Co.

To obtain additional information on equipment described here, use Inquiry Card on page 229.



"InvoMill" developed by Onsrud Machine Works, Inc., for machining grids for aircraft wings

Onsrud Automatic Electronically Controlled Power-Feed Router and Skin Mill Adapted for Aircraft Work

An automatic, electronically controlled power-feed router and skin mill called the "InvoMill," developed for faster, easier production of aircraft parts, has been brought out by the Onsrud Machine Works, Inc., Chicago, Ill. This machine is said to permit routing of thicker stocks of aluminum and other nonferrous metals than has heretofore been possible with hand-feed routers. The possibility of machining grids sufficiently heavy to support gas tanks and other parts inside aircraft wings provided by the new machine eliminates the need of internal bracing and fabricating, and greatly speeds up production.

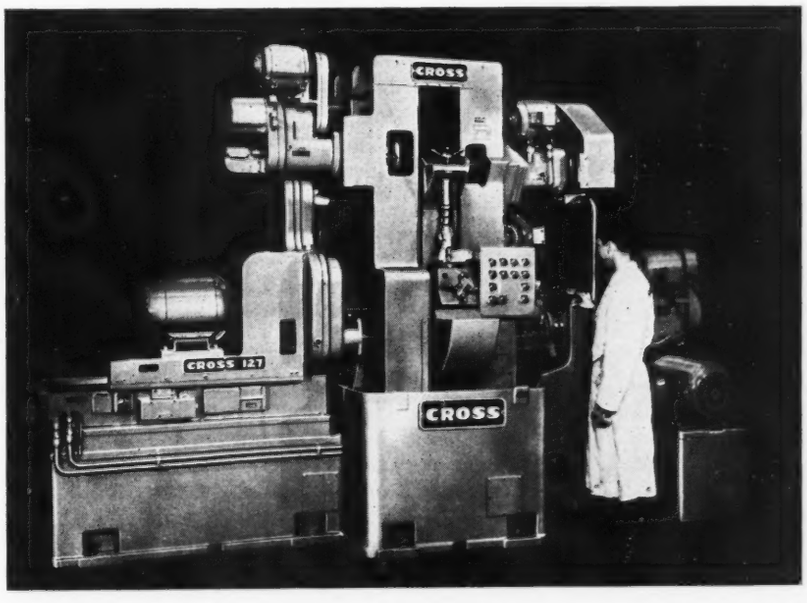
A 30-H.P. motor supplies ample power for routing aluminum stock 1 inch or more in thickness. This capacity especially adapts the machine for aircraft work, in which the trend is to thicker stock for greater structural strength, wider latitude for design improvements, and more economical assemblies.

The Onsrud "InvoMill" serves as a dual-purpose machine as, in addition to its use as a router, it is adapted for handling skin milling work on large aluminum parts used to form aircraft wings. A 40-H.P., 5400-R.P.M., direct-driven, liquid-cooled motor, mounted on the cross-rail, provides all the power necessary for tough milling work. Both motor and cross-rail can be tilted to varying degrees, thus providing a combination of angular settings without the use of sine plates. Three table widths of 72, 84, and 96 inches are available, bed lengths being furnished in multiples of 15-foot sections plus 7 feet for a conveyor. 77

Cross Special Machine for Processing Transmission Extensions

A unit consisting of two special machine tools arranged for processing transmission extensions has been built by The Cross Company, Detroit, Mich. With this equipment, 125 pieces can be finished per hour, employing one unskilled operator for each machine. The first machine (not illustrated) is a four-station trunnion type, with fluid-motor power indexing. A single-point tool is used for cross-facing the flange at the large end. An automatic balancing mechanism is employed for the cross-facing slide. At this machine, both ends of the extension are bored, the large end is faced, the flange holes in the large end are reamed, an oil-groove is machined in the small end, and two holes are chamfered and tapped in the mounting pad.

The second machine, shown in the illustration, is a six-station trunnion type, and, like the first machine, has fluid-motor power indexing. In this machine, the mounting flange is milled; the speedometer hole is drilled, bored, chamfered, and tapped; and two inspection cover holes are drilled, chamfered, and tapped. Other features incorporated in both of the machines include lead-screw feed for tapping and hydraulic feed for drilling, boring, and reaming operations. 78



Special six-station machine of two-machine unit for processing transmission extensions built by The Cross Company

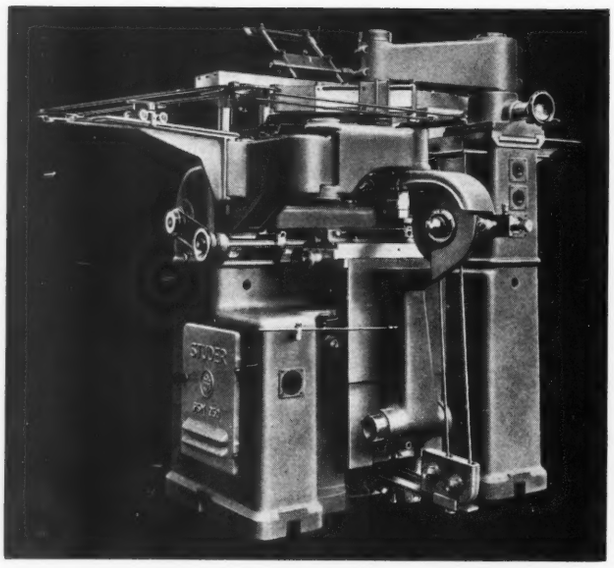


Fig. 1. Studer profile grinder introduced by Cosa Corporation

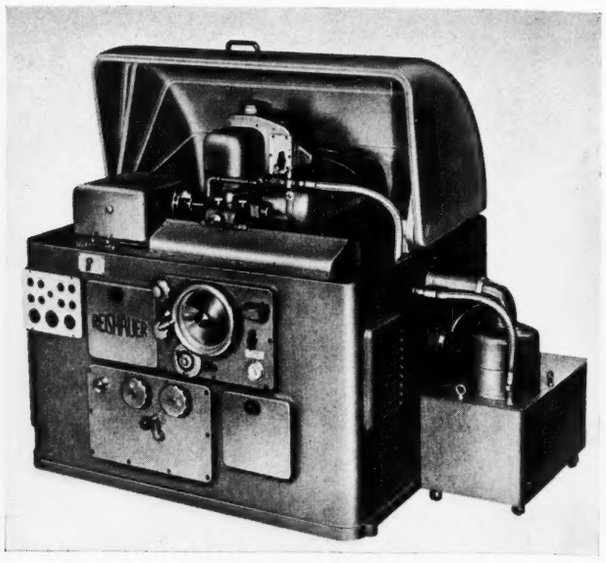


Fig. 2. Reishauer automatic thread grinding machine

Studer Profile Grinder and Reishauer Automatic Thread Grinding Machine

The Cosa Corporation, New York City, is introducing in this country a new and larger size Studer profile grinder made by Fritz Studer, Ltd., Thum, Switzerland. The increased capacity of this machine, designated Type PSM-250, permits grinding profiles up to 12 inches long at one setting. Flat work-pieces up to 4 3/8 inches thick and round pieces up to 10 inches in diameter can be handled. The maximum length of the template is 24 inches, and the pantograph is adjustable for ratios of from 1 to 1 up to 1 to 10. Profiles can be ground to a tolerance of $\pm$ 0.0002 inch, provided templates of the required accuracy are used.

This grinder, shown in Fig. 1, can be employed for relief-grinding the profiles of punching and drawing dies, and for grinding clearance angles on flat form tools from the template without distorting the profiles, when provided with the proper attachments. An attachment for automatically guiding the tracer along the template is also available. This automatic uniform feeding is designed to produce improved surface finishes and increase the life of the grinding wheels. Loosening two screws of this attachment permits guiding the tracer bar by hand.

The Cosa Corporation has also announced that it is introducing the Reishauer Type RAG automatic thread grinding machine made by the Reishauer Tool Works, Ltd., Zurich, Switzerland. This machine, shown in Fig. 2, is designed to grind very small and medium threads on straight or spiral fluted taps, micrometer spindles, worms, thread gages, screws, studs, etc. It is adapted for high-speed production, operates on the longitudinal feed principle, and employs a single thread grinding wheel. This method of grinding is said to provide maximum accuracy in producing fine-pitch threads. "Down" time is limited to changing the work-pieces.

The grinding wheel is trued automatically during the return stroke of the work-table. Measuring time is eliminated as the machine grinds to size. Only the wear of the truing diamond must be checked from time to time and adjustments made by hand.

The slide carrying the grinding head performs the movements for the feed and relief grinding. The head can be easily set to the helix angle. Longitudinal movement of the work-piece corresponding to the desired pitch is accomplished by the table slide. 79

Danly Hydraulic Metal-Working Machines

To facilitate the piercing and sizing of holes and to simplify many special operations, Danly Machine Specialties, Inc., Chicago, Ill., is manufacturing a new line of hydraulic machines and metal-working equipment. The new machines, originally developed and patented by the Mueller Engineering Co., Dearborn, Mich., are especially adapted for use in the automotive and aircraft industries. The simultaneous piercing of all holes and the trimming of automotive frame members, production riveting assembly operations on automotive frames, and the accurate piercing of holes and performing of related assembly operations on jet-engine components are examples of the work handled.

The wide range of applications of these machines is made possible by a basic unit of special design incorporating a hydraulic cylinder. These units have built-in blank-holding and stripping mechanisms which are entirely automatic, and are actuated hydraulically after the power stroke is completed. The sixteen-unit hydraulic machine shown in Fig. 1 pierces the holes in the flanges and web of automotive frame side bars in one simple operation. The cutaway views shown in Fig. 2 illustrate the action of the basic power cylinders. The units can be arranged at any angle.

Principal features of the hydraulic system include continuous pressure intensification, designed to permit wide flexibility in the addition of cylinders in the circuit of the power unit; and a special transfer valve which permits

To obtain additional information on equipment described here, use Inquiry Card on page 229.

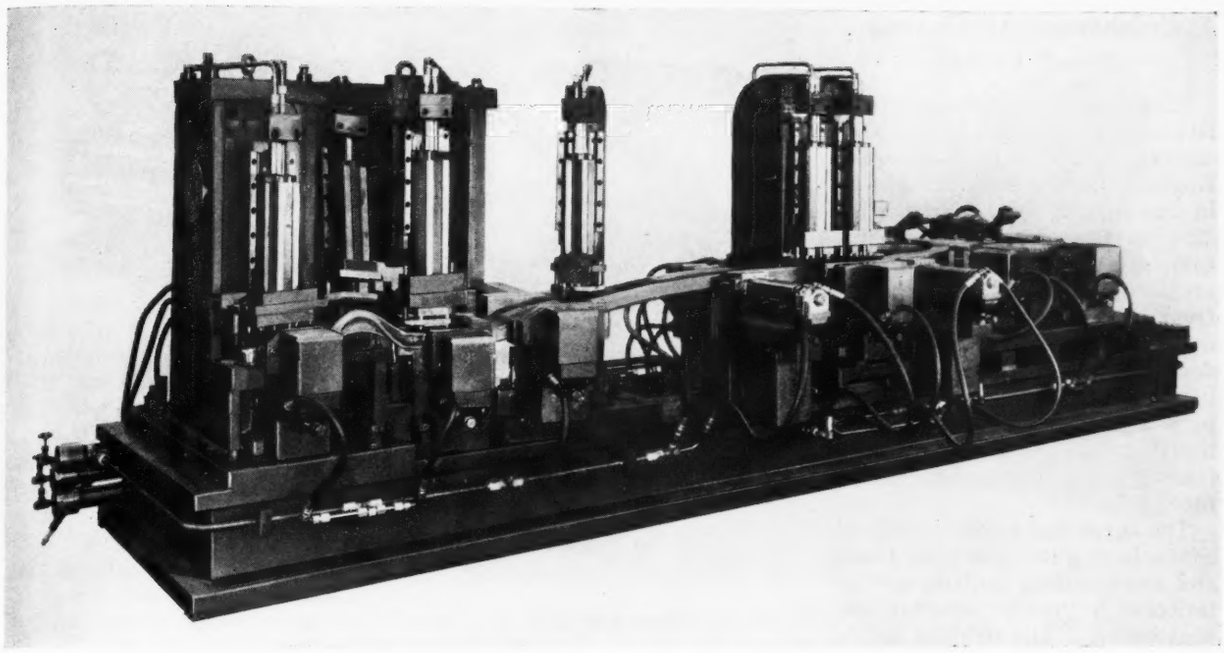


Fig. 1. Danly hydraulic machine for piercing holes in flanges and web of automotive frame side bars

handling extremely high pressures while eliminating hydraulic shock in the circuits. These features make it possible to obtain capacities of over 200 tons in relatively small compact cylinders.

The compact, rigid construction of the machines is said to make possible the punching of sheet steel under difficult conditions. Holes 21/64 inch in diameter, for example, have been punched in 5/16-inch thick high-carbon S A E 1095 steel, heat-treated to 41 Rockwell C. In some cases, it is possible to punch steel having a thickness that is greater than the hole diameter. 80

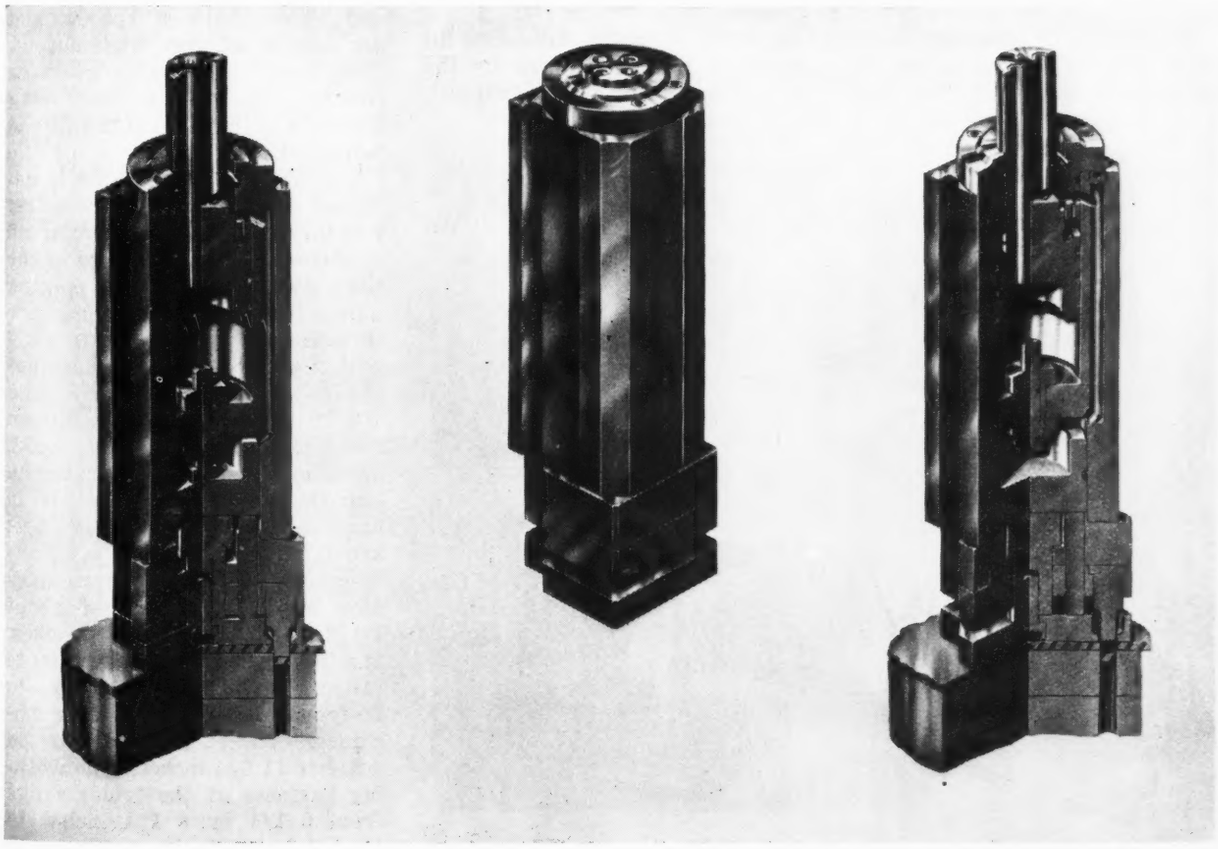


Fig. 2. Hydraulically operated cylinder of machine shown in Fig. 1. Cut-away view at left shows cylinder with power stroke completed, and view at right shows stripping action completed

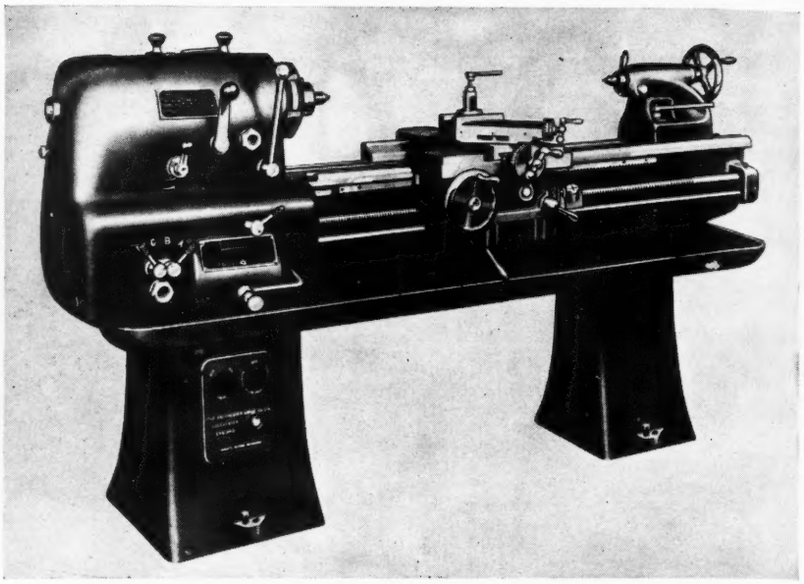
To obtain additional information on equipment described here, use Inquiry Card on page 229.

Colchester All-Geared Head Lathes

"Dominion" all-geared head lathes, manufactured by the Colchester Lathe Co., Colchester, England, and recently introduced in this country by the British Industries Corporation, New York City, are available in three sizes of 13-, 15-, and 17-inch swing. The front end of the spindle of these machines is carried on an SKF double-row cylindrical roller bearing, while the rear end is carried by a combined thrust and radial bearing. The cutting thrust is taken by a precision ball thrust race.

The apron has a double wall, all shafts having two bearings. Feed- and screw-cutting controls are interlocked to prevent simultaneous engagement. The straight bed is of the inverted-vee type. A wing type saddle provides long bearing surfaces to support the heavy compound slides. All models have self-contained motor drive, and the motor is controlled by a lever on the front of the headstock, operating through a built-in air-break starter.

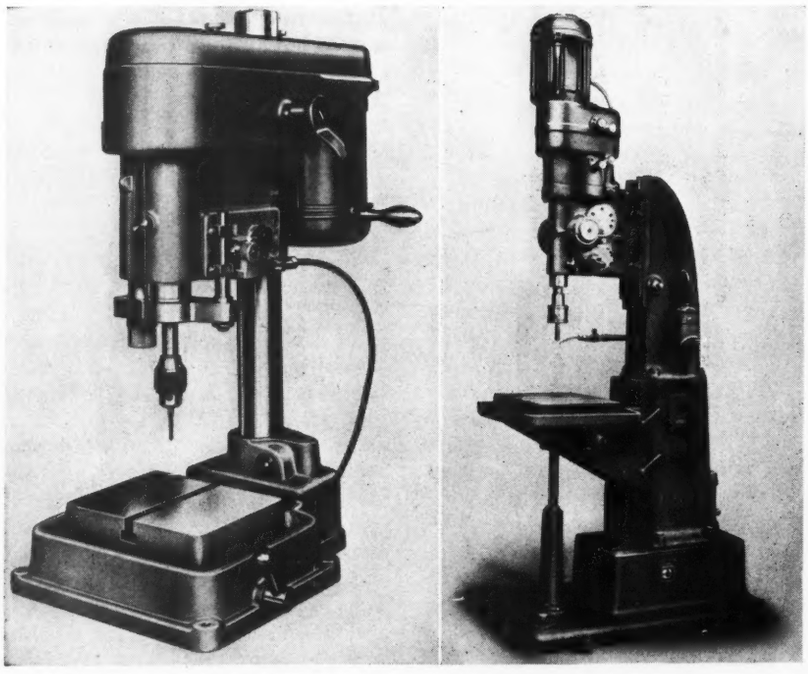
The headstock forms a totally enclosed oil bath, which is self-lubricating. 81



"Dominion" lathe of all-geared head type introduced by the British Industries Corporation

Huller Precision Automatic Tapping and Threading Machines

Five sizes of precision automatic tapping and threading machines made by Karl Huller, Ludwigsburg, Germany, are being introduced in this country by the Carl Hirschmann Co., Manhasset, N. Y. These machines, identified as Types UG 0 (shown in Fig. 1), UG 1, UG 2, UG 3, and UG 5 (shown in Fig. 2), are designed for mass production.



(Left) Smallest of five Huller precision automatic tapping and threading machines introduced in this country by the Carl Hirschmann Co. (Right) Largest of the five machines

The operation cycles are entirely automatic. The machines have positive electrical controls, exact limitation of feed depth, and wide ranges of speeds, and are capable of very high output. They have no reversing gears or clutches, the spindle feed being the same as the pitch of the thread being cut.

The Type UG 0 machine is designed for cutting the smallest size threads (5/32 inch maximum diameter), such as are used in the electrical and instrument making industries. The maximum size threads that can be cut in steel with the four larger size machines are about 3/16, 5/16, 1/2, and 1 3/16 inches; and the minimum size threads, about 1/8, 5/32, 3/16, and 1/4 inch. The maximum size threads that can be cut in brass are about 5/16, 1/2, 5/8, and 1 1/2 inches.

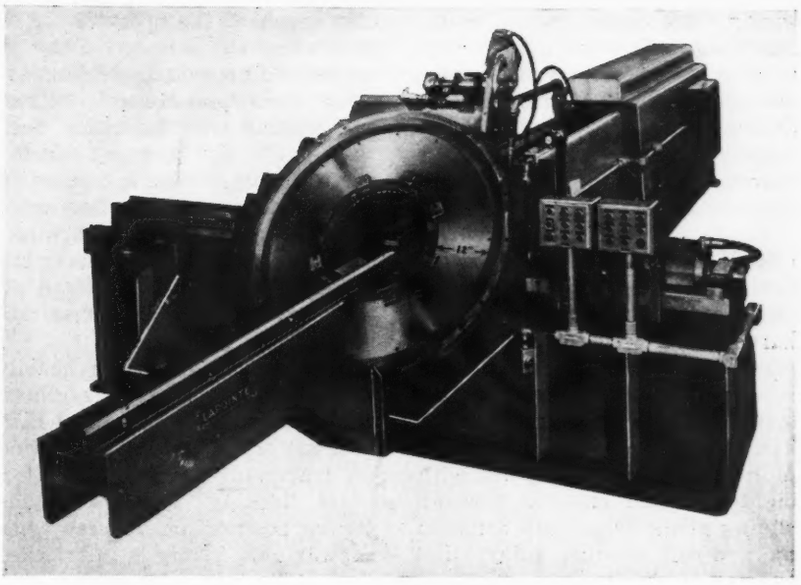
Spindles of the four machines have maximum travels of about 1 1/2, 2 3/16, 3 1/8, and 4 inches. Maximum reversals per minute range from 40 for the smallest to 20 for the largest of the four machines. Throat depths are from 4 3/4 to 11 3/4 inches. The working surfaces of the tables range from 6 1/4 by 8 1/4 inches to 13 3/4 by 20 inches. Maximum distances between chuck and table are 10 1/4 to 20 inches. 82

To obtain additional information on equipment described here, use Inquiry Card on page 229.

Fixture for Broaching Stator Rings of Gas Turbines

Broaching the stator rings of gas turbine engines for locomotives and stationary power plants has been expedited by a special broaching fixture designed by the Lapointe Machine Tool Co., Hudson, Mass. This fixture, which is shown in the illustration mounted on a Lapointe HP-40, 20-ton, 90-inch stroke horizontal broaching machine, will accommodate stator rings from 38 to 48 inches in diameter. The machine is operated with the conventional high-speed return stroke, which makes possible the broaching of forty to one hundred slots in stator rings at thirty-five seconds per slot.

The fixture is built with an adjustable travel of 15 inches. It is hydraulically indexed, and has a hydraulically actuated plunger and a fully automatic lubrication system. 83



Lapointe broaching machine and special fixture for broaching stator rings of gas turbines

Roller Coaters for Spreading Drawing Compound on Metal Sheets

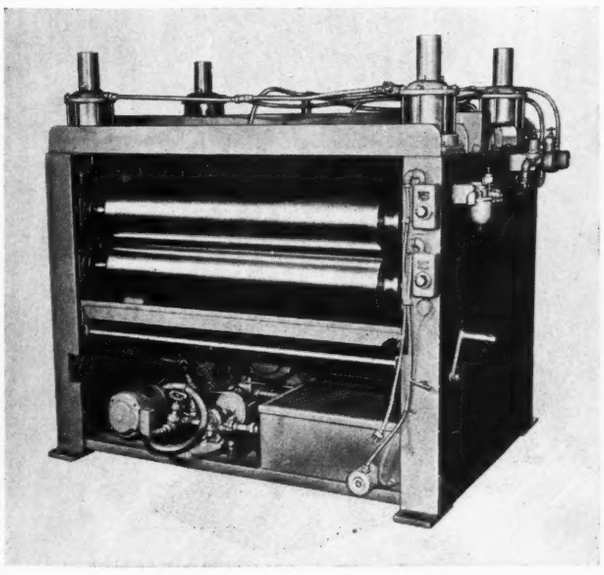
The Union Tool Corporation, Warsaw, Ind., is building a line of roller coating machines designed to uniformly apply drawing compounds to sheet steel prior to drawing operations.

The machine shown in the illustration is equipped with three pairs of rolls. The first pair is of hardened steel and is used for deburring the stock; the second pair is neoprene-covered and is used for actual application of the compound; and the third set is of hardened steel, which is used primarily as a squeegee for wiping off excess compound and for forcing the remaining compound into the pores of the metal.

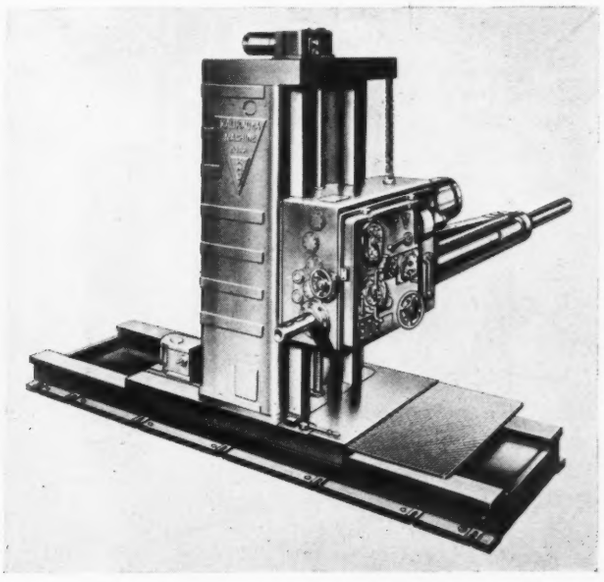
These machines are equipped with a circulating pumping unit for feeding the compound to the coating rolls. They are built in sizes to handle any stock up to 96 inches in width. 84

Kaukauna Heavy-Duty Horizontal Drilling and Tapping Machine

Column rigidity, unusual power, a wide range of movements, simplified operation, and power positioning are features built into a new horizontal drilling and tapping machine brought out by the Kaukauna Machine Corporation, Kaukauna, Wis. This machine has been developed to provide efficient high production on large, un-



Roller type machine for applying drawing compound to metal sheets, built by Union Tool Corporation



New heavy-duty horizontal drilling and tapping machine made by Kaukauna Machine Corporation

To obtain additional information on equipment described here, use Inquiry Card on page 229.

wieldy work-pieces, as well as on small parts. It is designed to give extreme accuracy, increased power, and greater range of operations in drilling, reaming, boring, counterboring, tapping, and spot-facing operations at the highest feeds and speeds possible.

The box type column is heavily ribbed, and the 4-inch diameter flame-hardened spindle has a travel of 42 inches and slides in a hardened steel sleeve mounted in precision Timken taper roller bearings. The drive motor for the spindle may be from 10 to 20 H.P. The spindle has a No. 5 or No. 6 Morse taper and is provided with eighteen speed changes through sliding gears, which are actuated by a direct reading rotary dial selector lever.

All controls are grouped at the front of the headstock within easy reach of the operator. The pilot wheel has an internal clutch, is overload protected, and is graduated for depth-control drilling and tapping with automatic feed "kick-out" at the pre-selected depth. The headstock is completely counterweighted, and it has rapid traverse and electric "inching" through a power-driven screw, the traverse motor being located on the sheave bracket. Traverse rate is 80 inches per minute.

The runway slides are heavily ribbed semi-steel castings gibbed to the runways, and have a 3-H.P. gear-motor and worm reduction for traversing the column. Electrical "inching" controls provide for fine positioning. A screw type, runway slide clamp is interlocked electrically with the push-button controls, and limit switches prevent over-travel. ----------85

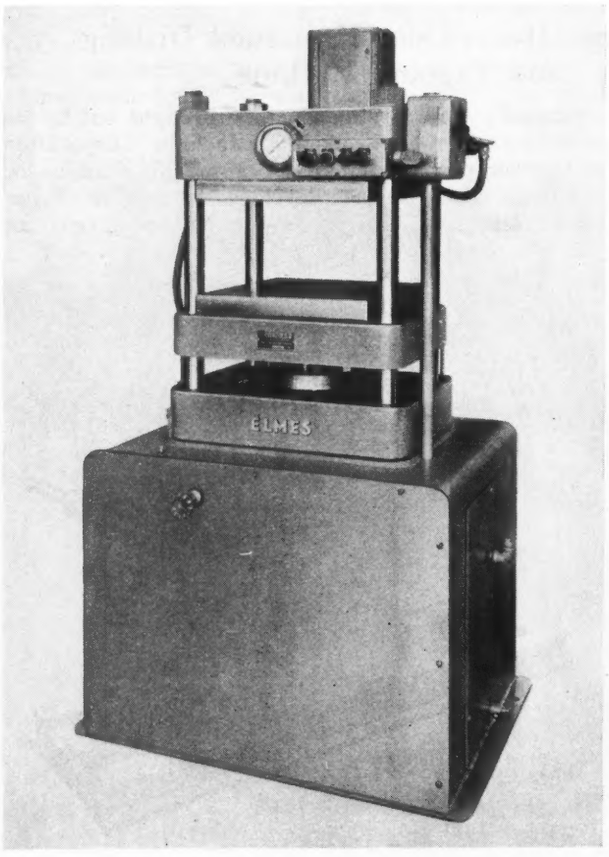
Elmes "Hydrolair" Molding Press Equipped with Electrical Control

The 50-ton floor model of the line of small, light-weight "Hydrolair" plastic molding presses built by the Elmes Engineering Division, American Steel Foundries, Cincinnati, Ohio, can now be furnished for semi-automatic operation. The "Hydrolair" presses are built on a hydraulic principle by which the operating power is taken entirely from the shop air line, no motor or pumps being used with this arrangement.

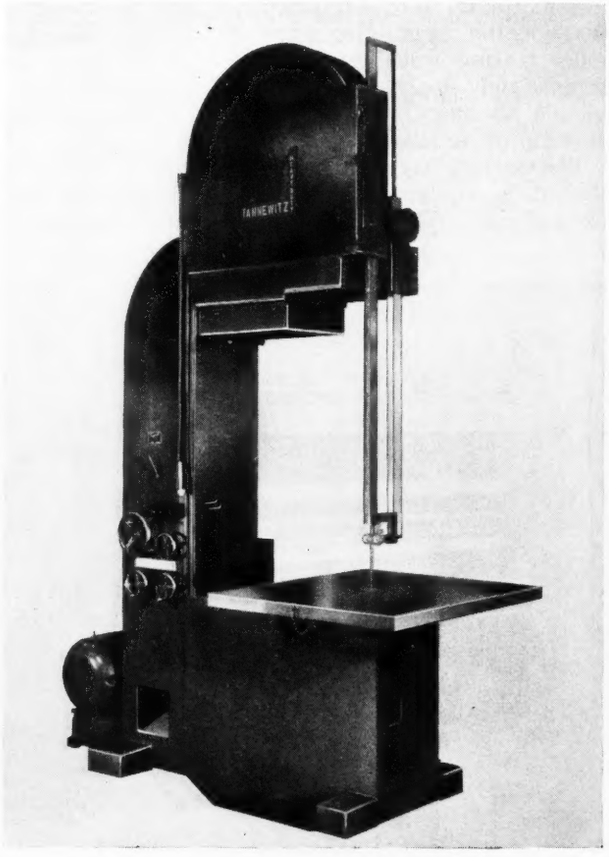
The pressure selected is automatically applied and maintained, even on compressible materials. These compact machines operate quietly, and are easily installed or moved. They are supplied completely equipped for operation. In addition to the 50-ton floor model available with either lever or electrical control, there are 30-ton bench and floor models with lever control only. ----------86

Huge Band Saw for Cutting Magnesium and Aluminum Castings

A band saw believed to be the largest ever produced for the sawing of magnesium and aluminum castings was recently furnished to the Wright Aeronautical Corporation by the Tannewitz Works, Grand Rapids, Mich. This machine, which is of welded steel construction, has a clearance of 55



"Hydrolair" molding press with electrical control designed for fast semi-automatic operation



Tannewitz band saw built for cutting large magnesium and aluminum castings

To obtain additional information on equipment described here, use Inquiry Card on page 229.

inches under the guide and employs 42-inch wheels.

All controls for raising and lowering the upper wheel, moving the guide post vertically, adjusting the counterweight to vary sawblade tension, and aligning the upper wheel are within easy reach of the operator. Both wheels are fitted with special outboard bearings, in addition to the conventional bearings, to prevent damage to the machine from extra heavy cutting. 87

Brazing Equipment for Removing and Replacing Carbide Tool Tips

A simple and speedy method of brazing carbide tips to tool shanks has been developed by the Valley Machinery & Supply Co., Rock Island, Ill. The equipment employed utilizes compressed air at a pressure of 75 pounds per square inch mixed with manufactured or natural gas at regular city line pressure, the premixed gas and air being distributed at about 1 1/2 pounds per square inch pressure to two refractory-cup radiant gas burners having a diameter of 2 1/2 inches.

Both burners are supported through adjustable clamps (one on either side of the tool being prepared) so that they are within 1/4 to 1/2 inch of the tool shank, with the burner center lines at a point about 2 inches behind the end of the tool. Thus a maximum rate of radiant heat transfer to the tool is obtained.

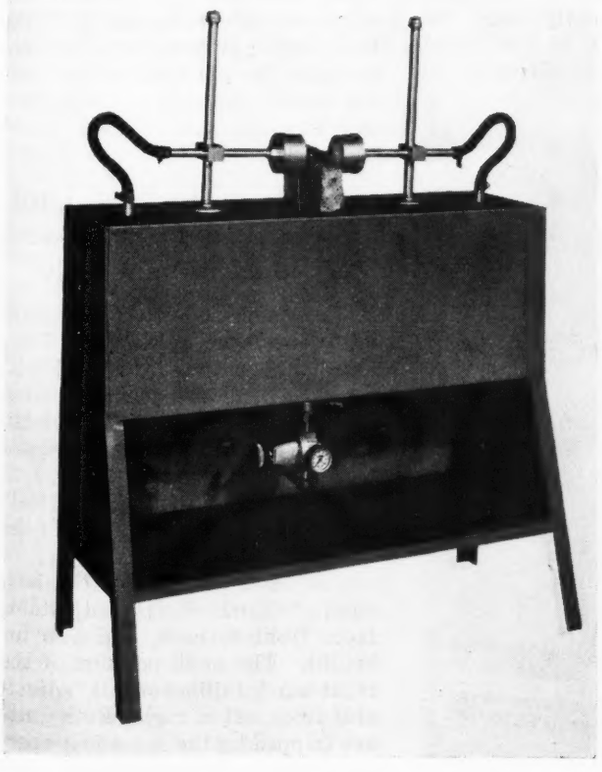
With this equipment, tips are removed and replaced on 1 1/2- by 1-inch tools in 2 1/2 minutes, and on 2 5/8- by 1 1/2-inch tools in 4 minutes. Because of the intensified local heating characteristics of the arrangement, it is said to be possible to use a higher temperature (bronze) bond instead of silver solder. 88

Froriep Single-Column Vertical Boring and Turning Mills

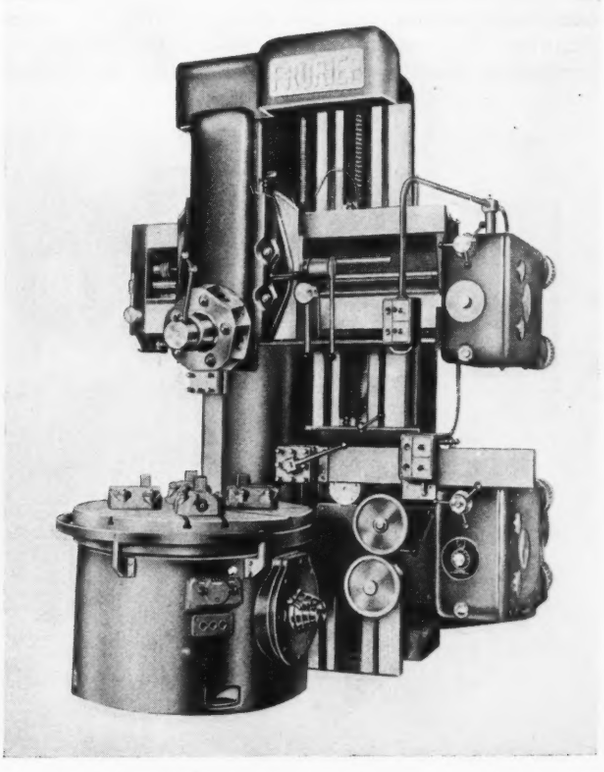
The Cosa Corporation, New York City, is introducing in the United States the Froriep line of single-column vertical boring and turning mills. These machines are constructed for accurate machining of smooth surfaces, and are designed to obtain maximum cutting efficiency with carbide or high-speed steel tools. The rigidly bolted bed and column and wide base are heavily ribbed. The cross-rail slide head and the side-arm head are completely independent, each being controlled by an individual set of feed and rapid return gears.

The geometrically graduated feeds for vertical and horizontal travel of the tools are controlled by three centrally placed levers. Engagement of all feeds and rapid return is effected by single lever control from the operating stand. The fine-adjustment control for the heads is so located on the slides that the tool cutting edge can be watched closely. The pentagon turret can be easily indexed by a single lever.

This boring and turning mill is made in four sizes having tables 39, 49, 55, and 63 inches in diameter, and will take work-pieces weighing up to 5 tons. Machines can be furnished with thread-cutting equipment, taper-turning equipment, tripping device, tracing device with electric tracer control, and coolant system. 89

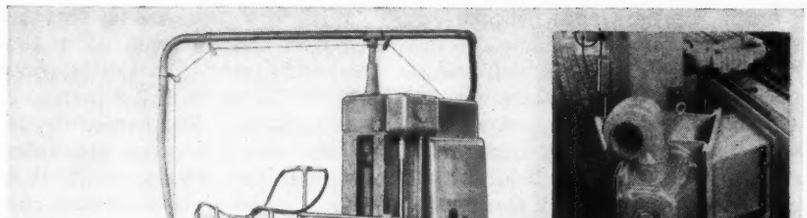


Equipment for removing and replacing carbide tool tips, developed by the Valley Machinery & Supply Co.



Froriep vertical boring and turning mill introduced in the United States by the Cosa Corporation

To obtain additional information on equipment described here, use Inquiry Card on page 229.



"Chipmaster" high-production planer announced by the Giddings & Lewis Machine Tool Co.

"Chipmaster" High-Production Planer Developed for Handling Wide Variety of Small Work

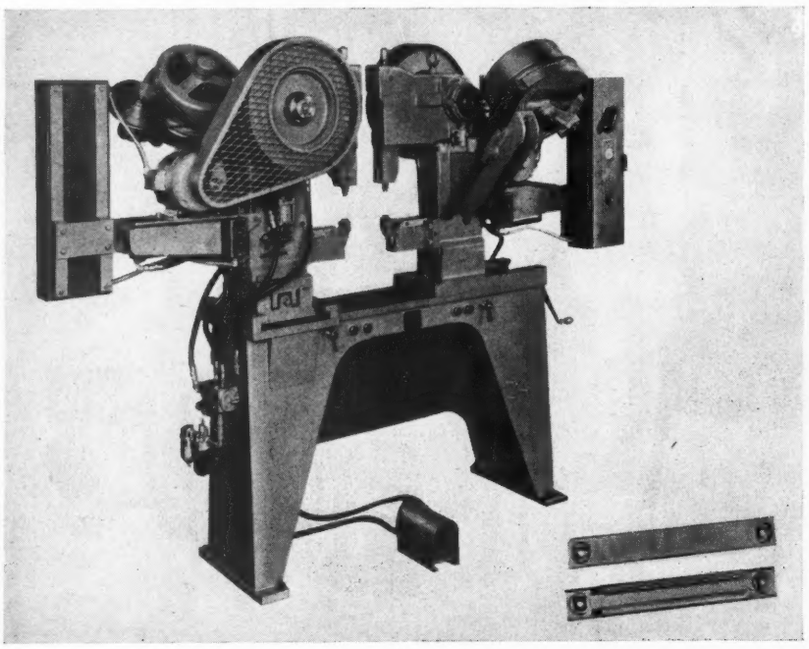
A high-production planer of radically new design, designated the "Chipmaster," has been announced by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. This machine incorporates at least ten outstanding production, construction, and operating features. It is essentially a high-production machine tool designed to handle a wide variety of small work.

Typical of the features incorporated in the "Chipmaster" are bonded non-metallic ways which prevent scoring. A new method of bonding enables the manufacturer to permanently bond the non-metallic ways to the table, thus eliminating the necessity for using dowels, pins, screws, and bolts, as well as the danger of scoring.

Combination air-hydraulic tool feeds provide fast, accurate feeding throughout the range of the planer. The fast feeding action permits a full feed to be completed on very short strokes, with deceleration so smooth that "coasting" is eliminated.

Balanced, smooth table travel is assured by an anti-friction drive. The new low-pressure angle rack gives greater tooth contact area between the bull gear and the angle rack. Mounting the motor directly on the machine bed to avert any possible chance of misalignment is another outstanding feature of the machine. This permits the machine to be installed or moved without requiring expensive foundation changes. It is also said that the machine does not require a floor of more than the usual thickness.

The cutting and return speeds of the table can be set to accommodate any cutting tool, either high-speed steel or carbide, for any type of cut needed. Quick selection of levers for feed and traverse is said to increase operator efficiency and to cut down fatigue. Separate air lifters on each head enable individual selection of tool lifts. The tool drop is cushioned to insure shockless seating of the tool-block. Micrometer dials are provided for practically all adjusting screws and rods to assure precise work. 90



Double "Clinchor" unit equipped for feeding and setting two nuts simultaneously

Double "Clinchor" Unit Developed to Set Two Nuts Simultaneously

Two new double "Clinchor" units have been built by the Tomkins-Johnson Co., Jackson, Mich., for the Ternstedt Division, General Motors Corporation, Detroit, Mich. These units are equipped to feed and set two 3/8- by 1/2- by 3/16-inch thick "Fabri-Steel" nuts at each operating cycle of the machine.

The anvil position of the left-hand "Clinchor" is adjustable from front to back, and also for height. The anvil position of the right-hand "Clinchor" is adjustable from left to right. Both units are tripped by the same foot-operated valve. Front and rear views of the work are shown in the illustration. 91

To obtain additional information on equipment described here, use Inquiry Card on page 229.

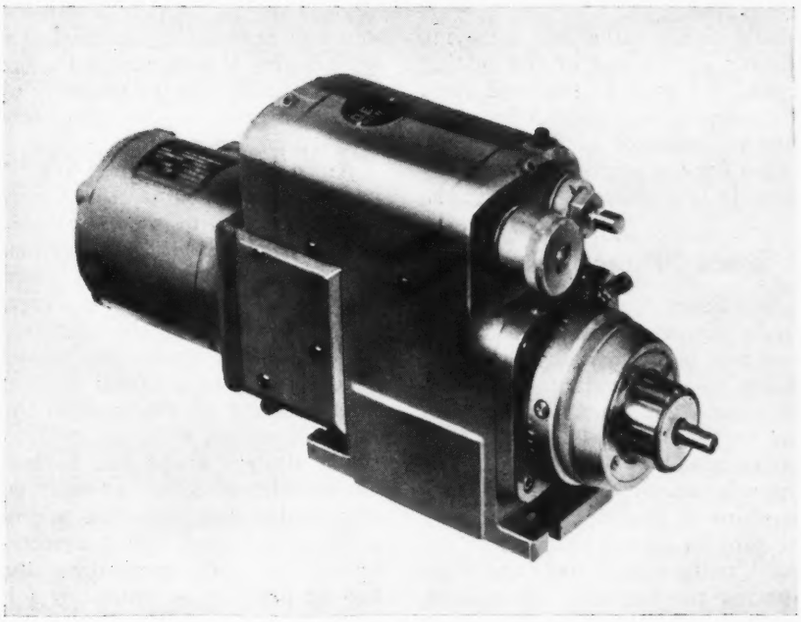
Delta Air-Hydraulic Drill Unit

The Delta Power Tool Division, Rockwell Mfg. Co., Milwaukee, Wis., has introduced a new air-hydraulic drill unit of simple design developed for rugged high-production work requiring drilling, reaming, tapping, chamfering, spot-facing, centering, and similar operations. Because of the infinitely variable feeds available, which eliminate the need for cams, the units can be quickly adjusted to suit the requirements for each operation. With their built-in switches, any number of these units can be mounted on a framework and be electrically interlocked with the fixtures, index mechanisms, etc., to constitute a special machine.

Thrust for feeding the tool is obtained by energy received from the compressed air supply of the plant. The feed control is a sealed pumpless hydraulic system. Depth control is obtained by adjustable positive stops. The normal operating cycle includes rapid advance to the work, drilling feed, and rapid return movements. The sealed unit construction permits operation of the unit in any position without changes.

Controls for feed, rapid traverse, and final depth are all infinitely variable for their entire range. Feed control from 0 to 70 inches per minute is obtained through a metering valve. The rapid advance is 6 inches per second, and is variable in length up to the full stroke of the unit. The stroke ranges from 0 to 1 1/2 inches, controlled by a positive stop. The return rate is 5 inches per second.

A 1/3- or 1/2-H.P. motor can be used to drive the unit, which has a capacity for drilling holes up to 5/16 inch in diameter in steel. The spindle can be driven directly, through gears, or by belts. 92



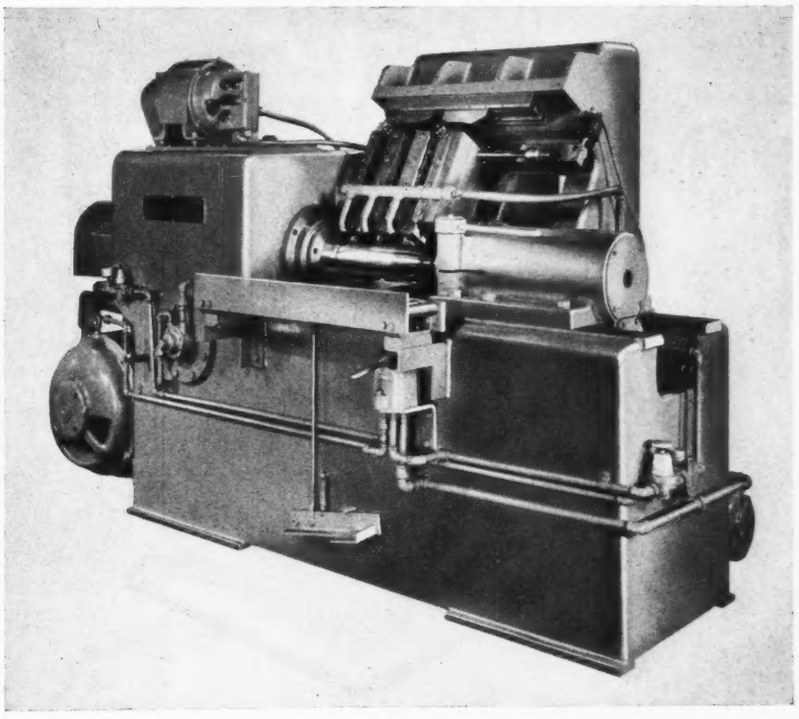
Air-hydraulic drill unit announced by Delta Power Tool Division of the Rockwell Mfg. Co.

Stamets Shell Lathes

The Wm. K. Stamets Co., Pittsburgh, Pa., has developed a new shell lathe that is available in three sizes for handling shells ranging from 75 to 240 millimeters. Three machining operations are performed on these new lathes, which consist of cutting off the open end to the proper length and facing the base; rough-turning; and finish-turning.

The machine has a bed with an integral headstock, a separate tailstock, and a separate tool-slide and cam unit. The spindle is mounted in the headstock on anti-friction bearings, and is driven by means of a worm and gear with a chain drive to the spindle motor. The chuck is of the expanding grip type, operated by a rotating air cylinder. The tool-slide is actuated by a screw, driven from the spindle by a gear train through change-gears. The tool unit contains sliding tool-blocks which are moved into the work by cam rollers.

The tailstock is an air-operated piston with a live center to hold the base end of the shell. A roller conveyor and loading rails are provided to assist in placing the



Stamets lathe recently developed for use in the production of three sizes of shells

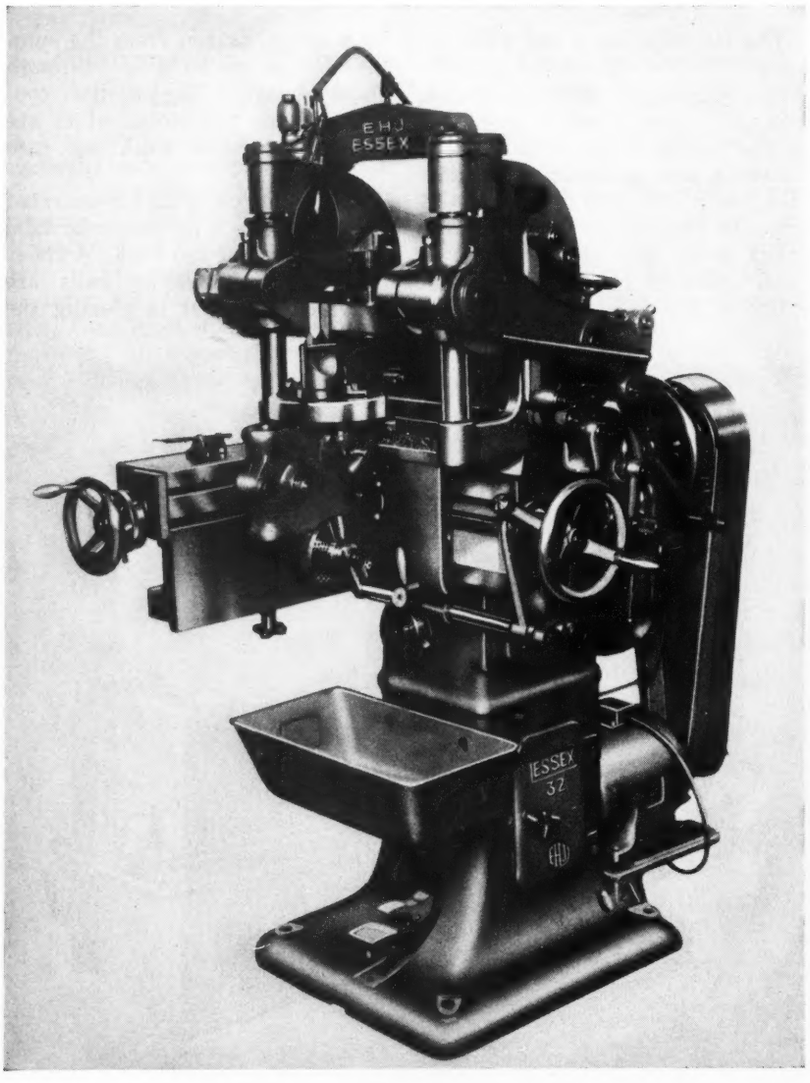
shells in the lathe and removing them. At the end of the cutting cycle, the shell is removed from the machine and carried down the line by conveyor to the next machine for the performance of succeeding operations. 93

Essex "Punch Shaper"

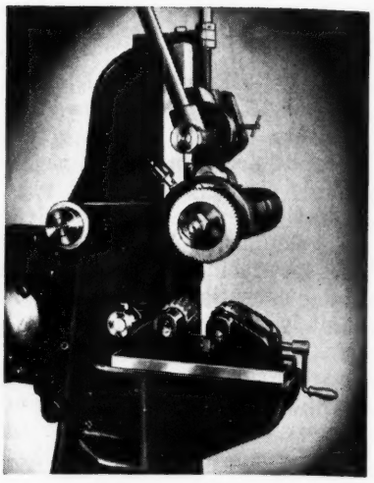
The Essex "punch shaper," originally manufactured in Germany and now being made by the E. H. Jones Co. in England, has been introduced on the American market by the British Industries Corporation, New York City. The "punch shaper" is designed to machine a blanking punch, hob, or profiled part directly from the solid, using simple tools and eliminating the necessity for making special punch holders or plates. The machine can be easily set up and will produce a part having a high degree of accuracy and a fine surface finish. In the majority of cases, punches can be completely finished on this machine.

An ordinary shaping tool is used in the machine, the stroke being like that of a conventional shaper set in a vertical position. The stroke is adjustable from 1 1/2 to 4 1/4 inches. However, upon completion of the predetermined straight stroke, the rocker arm operates in a swivel motion, thus finishing off the work to the required radius.

The desired shape can be laid out or a template can be soldered or mounted in place. The microscope attachment is set directly above the work, permitting the lay-out lines to be accurately followed and close limits held without difficulty. 94



Essex "punch shaper" introduced in this country by the British Industries Corporation



Cut-off machine equipped with pipe and tube de-scaler and cleaning attachment

Continental Pipe and Tube De-Scaler and Cleaning Attachment

A new pipe and tube de-scaling and cleaning attachment for Steen cut-off machines has been brought out by the Continental Machine Co., Chicago, Ill. This attachment, mounted on the machine as shown in the illustration, removes rust, scale, paint, and other deposits from pipes, posts, and building columns. It is especially adapted for reclaiming used pipes and tubes. Sizes are available for cleaning pipes up to 12 inches in diameter.

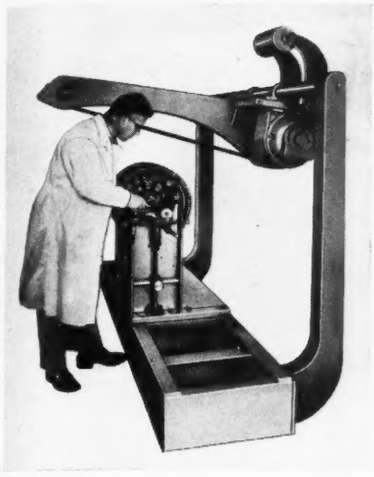
Most work requires only one pass through the rollers to remove all deposits. Feeds up to 20 feet of pipe per minute are available for production work. 95

Wagner Universal Dynamic Balancing Machine

A universal dynamic balancing machine, designed to provide a simple method of putting armatures, rotors, pulleys, flywheels, gears, hubs, drums, etc., in true dynamic balance, is now available from the Industrial Engineering Equipment Co., Davenport, Iowa. The part to be balanced is placed on the balancer with shafts resting on ball-bearing rollers, and then rotated to determine the position of dynamic unbalance, so that corrective weights can be added.

The driving mechanism consists

To obtain additional information on equipment described here, use Inquiry Card on page 229.



Universal dynamic balancing machine announced by the Industrial Engineering Equipment Co.

of an arm with a set of five V-belts, driven by a 5-H.P. motor. The arm is balanced so that it normally remains in the upper position. In use, the arm is lowered by the operator until the belts touch the equipment to be rotated. A starting button is then pushed, and when the desired speed has been reached, the arm is raised.

While rotating, the shafts are marked with pencil or crayon. Because unbalance causes the shaft to rotate off center, the markings will appear on one side, thus showing where weights should be added. Rotation can be stopped almost immediately by lowering the arm and pushing a reverse button.

The balancer will handle equipment up to 48 inches in diameter by 80 inches in length, weighing 4000 pounds. 96

Norton Automatic Wheel Truing Device

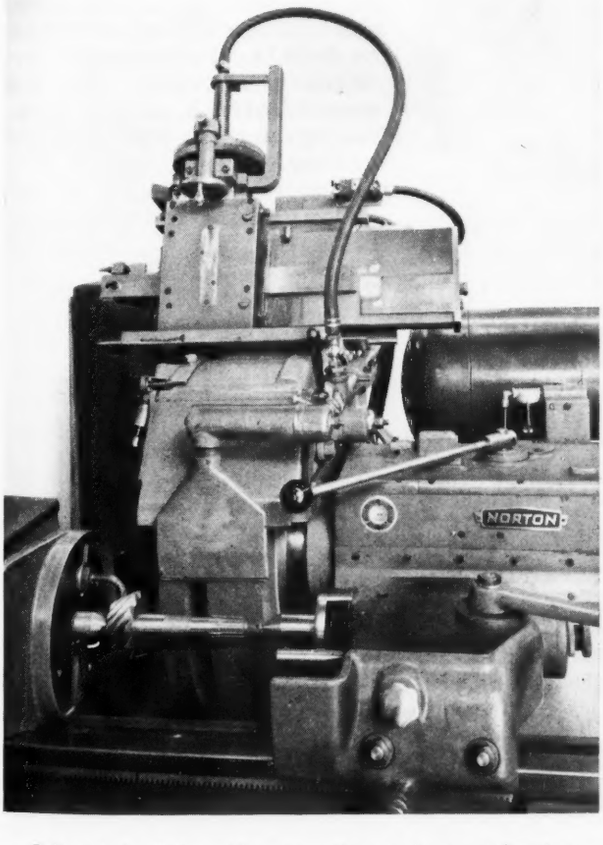
A device that automatically performs angular, step, straight, or combination form-truing of the face of a grinding wheel at the touch of a push-button has been developed for use on all cylindrical grinding machines built by the Norton Co., Worcester, Mass. This truing device is mounted on the wheel guard and has the truing diamond located inside the guard above the wheel.

The truing diamond travels forward and back across the wheel face at a predetermined traverse speed when the push-button is pressed. Changes in speed and feed can be made quickly. The traversing speed of the diamond when not in contact with the wheel is automatically increased to reduce the over-all truing time.

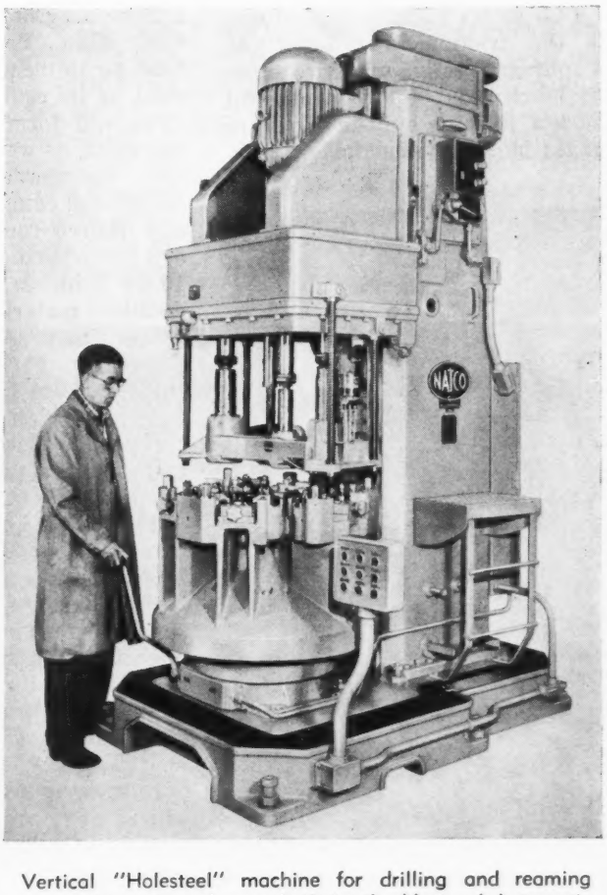
An important advantage of this wheel-guard truing device is that it permits close control of the amount of abrasive removed from the wheel, and thus reduces the wheel cost per piece ground. Also it allows the wheel to be trued without disturbing the table settings and without requiring special positioning of the wheel-head. Improved accuracy and uniform quality of finish are said to result from the use of this equipment. 97

Natco Vertical "Holesteel" Drilling Machine

A new vertical "Holesteel" drilling machine, designed for core-drilling, drilling, and semi-finish reaming twenty connecting-rods and caps per hour, has just been completed for an automotive manufacturer by the National Auto-



Cylindrical grinder with automatic guard-mounted truing device for formed grinding wheels recently brought out by the Norton Co.



Vertical "Holesteel" machine for drilling and reaming connecting-rods and caps, built by the National Automatic Tool Co., Inc.

To obtain additional information on equipment described here, use Inquiry Card on page 229.

matic Tool Co., Inc., Richmond, Ind. This machine, known as Model C2A, has a flat slide on which is mounted a fixed-center gear-driven head containing four spindles mounted in anti-friction bearings.

The three-position, manually operated rotating table on this machine is 24 inches in diameter. A three-position fixture is arranged to accommodate one connecting-rod and cap in each position while the following operations are being performed: Remove and load one rod and one cap at the first position; core-drill one hole and drill one hole in the rod at second position; and core-drill one hole in the cap and semi-finish ream one hole in the rod at the third position. 98

Famco Air-Operated Presses

The Famco Machine Co., Racine, Wis., has just announced a new air press, which is available in twenty models covering a capacity range of from 1/2 ton to 3 1/2 tons. This press is especially designed for heavy, continuous production work.

One of its many new features is the frictionless cylinder, of diaphragm design, which requires no lubrication of any kind. All models have a built-in pressure gage; infinitely adjustable stroke, coupled with extra long maximum strokes; ram keyed to prevent rotation; large working surface; and stepless vertical adjustment, with no bolts to remove or become loose. 99

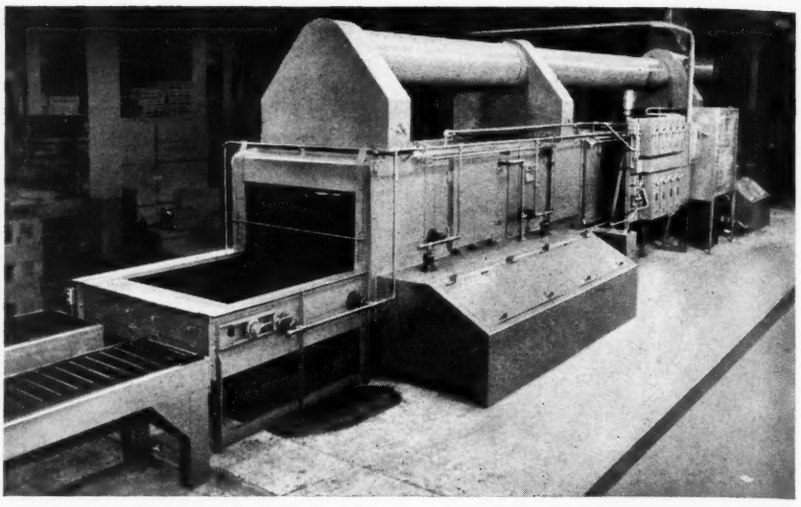
Air press of new design built by the Famco Machine Co.

"Bendit" Metal-Forming Machine

The latest model "Bendit" metal-forming machine, built by Kilham Engineering, Inc., Plainville, Mass., has a capacity for bending 15 inches of 18-gage mild steel, or its equivalent. This machine will form sheet, strip, and rod stock, as well as small tubing, into innumerable shapes, both simple and complex. It will form any desired radius from 1/32 to 5/8 inch; make boxes up to 15 by 15 by 5 inches; and handle low-ductile materials. Plated or painted metals can also be bent without fracture or injury to the surface, when the radius of bend is large enough to avoid cracking the paint. Bends of any angle, including complete folds and partial bends, can be made.

The machine was developed primarily to eliminate the need for expensive dies and intricate tooling on short-run production work, such as forming aircraft components. It is provided with positive stops and gages for accurate duplicating, and has an open-ended front and back for feeding long strip stock.

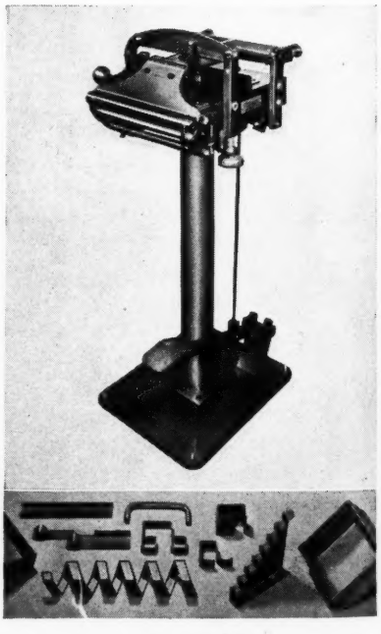
Interchangeable bending blades of soft steel, which can be cut or sawed to size to meet job requirements, are supplied. The actual bending is done by a hardened and ground steel roller. 100



Rustproofing machine brought out by Industrial Washing Machine Corporation

Large Capacity Conveyor Type Rustproofing Machine

The Industrial Washing Machine Corporation, New Brunswick, N. J., is manufacturing a Model CT-RP conveyor type rustproofing machine of new design, which has a conveyor space capacity of 500 square feet per hour. This new machine is already being used in a government plant. The machine first sprays the work with a rust preventive, after which the built-in, explosion-proof, infra-red oven quickly dries the sprayed surfaces of the work. Then the work is cooled to permit handling.



"Bendit" metal-forming machine and typical examples of work

To obtain additional information on equipment described here, use Inquiry Card on page 229.

Safety features include an automatic CO_2 system and fully electrical operating controls. The continuous conveyor is kept clean and free of residue by a special rotating brush and a detergent spray. This self-cleaning feature eliminates the need for stopping the machine and interrupting production in order to clean the conveyor. The machine is adaptable for handling work in a wide range of shapes and sizes. 101

Collar Edging Rolls Designed for Niagara Rotary Machine

Collar edging rolls have been developed by the Niagara Machine & Tool Works, Buffalo, N. Y., for use in preparing a round sheet metal pipe for joining with a flat sheet. The contour of the rolls raises a substantial bead above the surface of the pipe, and at the same time, crimps the edge, so that it is smaller than the pipe diameter. The crimped side of the bead lies flat and provides a good seat for the sheet.

The unusual height and shape of the bead produced by the rolls permits the crimped edge to be easily peened over to form a tight joint with the sheet. The rolls are made of alloy steel, hardened and polished. They can be used on the Niagara No. 164 universal rotary machine for use in edging up to 24-gage mild steel, and on the No. 172 electric combination machine for use on mild steel up to 20 gage. 102

Drill and carbide grinder made by McDonough Mfg. Co.

Improved Sterling Drill and Carbide Grinder

Several refinements and improvements have been made recently in the drill and carbide grinder built by the McDonough Mfg. Co., Eau Claire, Wis. One improvement is a simplified adjustment designed to compensate for grinding wheel wear, and thus improve the accuracy with which the machine can be set for grinding drills of various diameters.

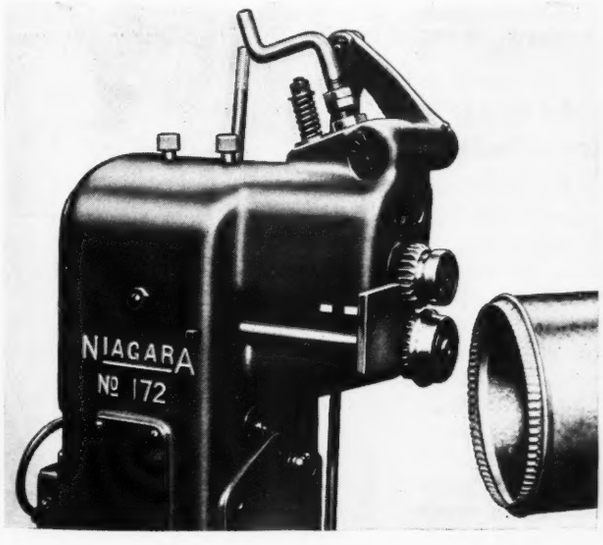
Another improvement is the permanent mounting of a diamond wheel dresser on the drill grinding wheel guard, where it is always available for easy dressing of the wheel. When not in use, the dresser swings back out of the way, so that it does not interfere with the drill grinding operation.

A graduated quadrant has been added to the table on the carbide tool grinding side to facilitate accurate setting for the clearance angles. A diamond holder for dressing the wheel on this end and a lighting fixture mounted on flexible tubing are standard equipment. The light can be positioned at either end of the machine. In addition to grinding standard drills, this machine can be used for sharpening three-lip core-drills. 103

Sheffield Remote Electronic Gaging Head

The Sheffield Corporation, Dayton, Ohio, is now supplying the N-6 "Internalchek" with a new remote electronic gaging head. Standard dual amplifications are 1000/2000, 300/3000, 5000/10000 to 1.

This instrument is normally used in the tool-room or gage laboratory for checking master and working ring gages, setting snap and length gages, and checking tools and other high-precision work having one or more internal dimensions. It is also adapted for use on small runs involving a great variety of bore sizes that have close tolerances. Precision blocks or masters are employed as a reference in setting up the instrument. Both bench and console-base models are available.



Niagara universal rotary machine equipped with collar edging rolls

Remote electronic gaging head announced by the Sheffield Corporation

The head has a wide gaging range, covering diameters of 0.370 inch to 12 inches. The maximum gaging depth from surface plate to center of the diamond point is 1 1/2 inches. By turning the part over, the hole can be checked for a depth of 1 1/2 inches on the opposite side, making it possible to check a hole through a piece 3 inches thick for diameter, taper, bell-mouth, and out-of-roundness.

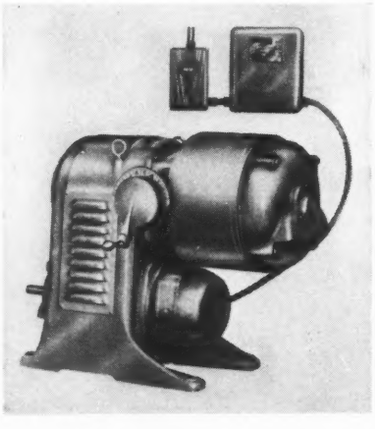
The capacity of the standard instrument is sufficient to accommodate an A.G.D. ring of the largest size. On special order, it can be supplied with gaging arms for checking holes down to and including 0.240 inch in diameter. The maximum gaging depth from surface plate to center of diamond point on the arms is 1 inch.....104

"Varidrive" Motor with Brake Attachment

Quick acting, controlled braking of variable-speed "Varidrive" motor units made by U. S. Electrical Motors, Inc., Los Angeles, Calif., is obtained through the application of a Warner Type ICB brake. This brake is mounted directly on the variable-speed shaft, and thus eliminates the transmission of the braking action through the belt. The brake is especially adapted for use in "inching" or jogging, and provides instant, shockless operation without noise. The frictional force is controlled directly by the magnetic action of the brake.

The braking torque can be closely adjusted and permanently set. This is an important feature in applications demanding accurate regulation. For installations requiring varying braking torques, the adjustment is easily made by a knob-controlled rheostat.

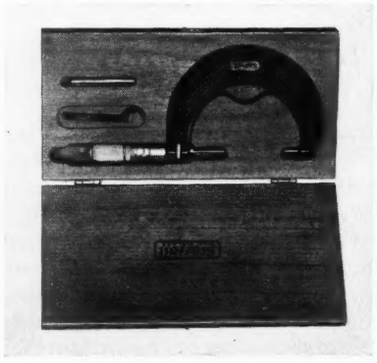
The brake is adaptable to both "Varidrives" and "Varidrive-Syncrogears." It is actuated by direct current, and has low power requirements. When only alternating current is available, power conversion units are used to provide the 25 to 35 watts direct current required. 105



"Varidrive" motor unit with quick acting brake

Starrett Micrometer for Measuring Crankshafts

The L. S. Starrett Co., Athol, Mass., has just brought out a new micrometer designed especially for crankshaft measuring. The 3-inch frame has a diameter measuring range of from 1 1/2 to 2 1/2 inches. The longitudinal reading-point line on the sleeve is on the under side of the thimble, where it is plainly visible while measuring. Rust-resistant, satin chrome finish on sleeve and thimble makes markings stand out clearly.....106

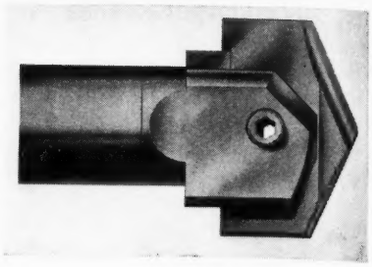


Micrometer for measuring crankshafts, made by the L. S. Starrett Co.

Interchangeable Spade Drills and Core Drills

The Conner Tool & Cutter Co., Detroit, Mich., recently announced that it has standardized and is now carrying in stock a complete line of spade drills and core drills. These tools are designed to drill a hole of the required diameter from the solid in one operation, and need not be retracted to clear them of chips.

Eight sizes of tool-holders accommodate the 256 sizes of high-speed spade drills, which vary from 1 inch to 5 inches in diameter, by steps of 1/64 inch. All holders also accommmodate core drills, which are available in the same stock sizes in both high-speed steel and tungsten-carbide tipped types. 107

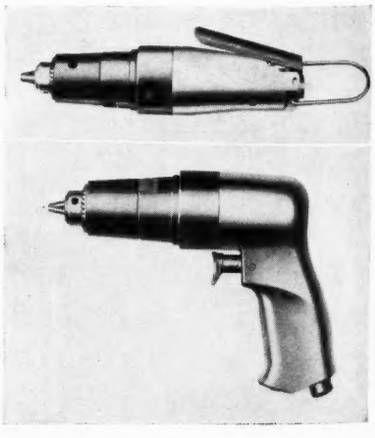


Spade drill of new line announced by Conner Tool & Cutter Co.

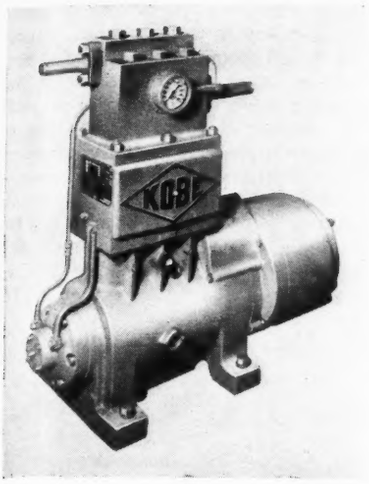
Light-Weight Air Drills

A new series of small, light-weight portable air drills has just been announced by the Ingersoll-Rand Co., New York City. Outstanding features of these drills include one-piece housing, designed to provide a compact, well balanced, exceptionally short, and light-weight drill; more powerful five-vane air motor, redesigned to provide a smooth, uniform flow of power; built-in automatic lubricator; improved throttle valve designed to eliminate air leakage; specially designed muffler that minimizes exhaust noise, with an adjustable exhaust deflector to permit the operator to direct exhaust air in any direction.

These tools are furnished in several different speeds for use with drills up to 1/4 inch in diameter. The units weigh from 2 3/8 to 3 1/8 pounds. Attachments—both straight and angle types—are available for reaming, tapping, sanding, and close-quarter drilling. 108

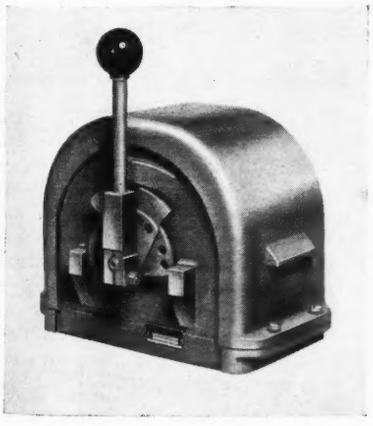


Two of a new series of Ingersoll-Rand portable air drills



High-Pressure Triplex Pump

Compact high-pressure triplex pump recently introduced by Kobe, Inc., Division of Dresser Equipment Co., Huntington Park, Calif., as a heavy-duty packaged hydraulic power generator for all types of hydraulic power systems. The unit is available in 15-, 30-, and 50-H.P. sizes, with pressure ratings up to 5000 pounds per square inch and displacement ratings up to 60 gallons per minute. Special heads with pressure ratings of 10,000 and 20,000 pounds per square inch are available. The unit can be obtained with an integral, drip-proof Sterling electric motor drive. 109

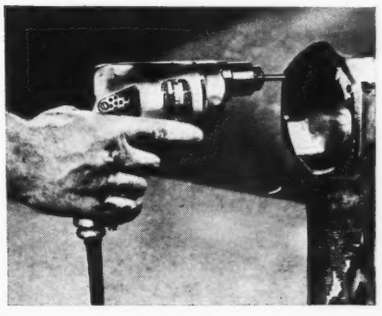


G-E Heavy-Duty Master Switch

Redesigned master switch with new cast-aluminum cover and up to five adjustable stops, announced by the General Electric Co., Schenectady, N. Y. Especially adapted for use on large material-handling equipment and other heavy-duty installations. The adjustable stops provide for moving control handle to different positions in a clockwise or counter-clockwise direction. The new switch is interchangeable with former G-E types. It is 13 inches wide, 10 inches deep, and approximately 14 inches high with the handle in a vertical position. Standard equipment includes a ball and rod control handle, but four other types are available, including handles with thumb levers...110

New Model "Holgun" Drill

New model of 1/4-inch "Holgun" drill announced by the Black & Decker Mfg. Co., Towson, Md. This redesigned model has a new handle which is shaped to give plenty of finger room, and it is rated for heavy-duty, continuous production service. Outstanding features include full-size ball bearings, heat-treated gears, splined gear-shafts, and smooth-contour aluminum housings.



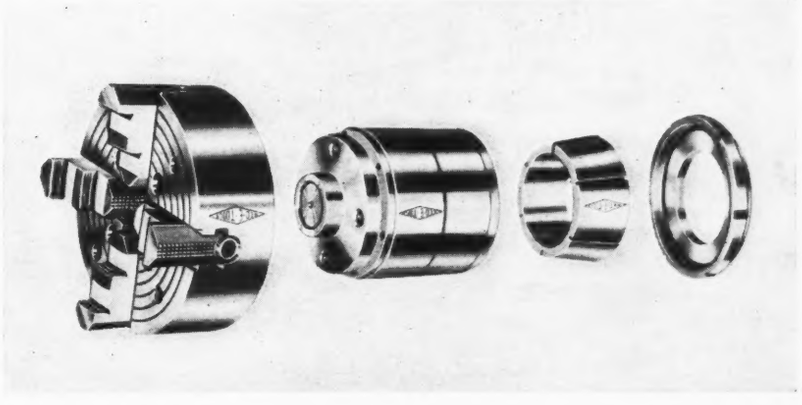
Available for standard or low speed. The standard speed unit has a non-load speed of 1700 R.P.M. (optional speeds, 2500, 3500, or 5000 R.P.M.), while the low-speed unit has a non-load rating of 600 R.P.M. (1000 R.P.M. speed optional). Compact in design; weighs only 3 1/4 pounds. 111

Alpine "Contro-Therm" Quench Tank

New quench tank of the constant-level, recirculating type introduced by A. D. Alpine, Inc., Culver City, Calif., designed to receive work from a mechanical loader. With this equipment, the entire load is removed from the furnace and quenched in one operation. This "Contro-Therm" quench tank cools and circulates the quenching liquid. An air-flow circulator may be added to adapt the tank for use with more than one furnace. Equipment includes a reserve and cooling tank, pump, and motor. The quench tank legs are designed to allow the loader base to slip under the tank, so that the work can be deposited mechanically in the quenching liquid. Over-all dimensions of tank are: Width, 30 inches; length, 42 inches; depth, 30 inches. 112

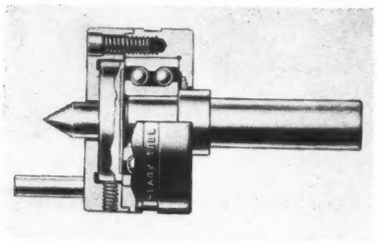
Outside Spindle Tailstock Center for Mounting Chuck

New Red-E anti-friction precision center designed for mounting an independent chuck on the tailstock spindle of a lathe. This center, developed by the Ready Tool Co., Bridgeport, Conn., serves to provide an accurate means for holding the work when turning irregular-shaped pieces. It insures accurate alignment of the tailstock end of the work with the headstock when turning uncentered work, such as forgings, castings, crankshafts, and similar pieces. The center is mounted on the outside spindle of the tailstock and is held securely by a hardened and ground tapered bushing. It can be made to fit any size or make chuck. The anti-friction bearings are greased for life. ..113



Red-E Special Adjustable Floating Type Anti-Friction Center

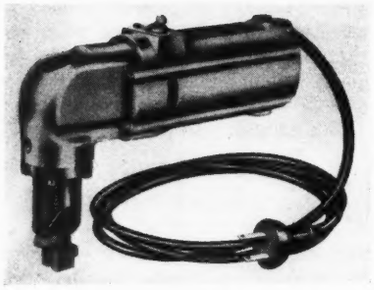
New adjustable floating type live center that enables expansion type hand reamers to be correctly ground, so that the reamer teeth will be concentric with the front pilot surface. With this center, the operation can be performed in a universal tool and cutter grinder, eliminating a cylindrical grinding operation. The



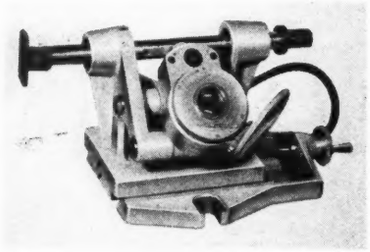
amount of stock ground from each tooth per sharpening operation, is thereby reduced, and the reamer life correspondingly increased. These centers are available from the Ready Tool Co., Bridgeport, Conn., in various tapers or straight shank sizes. 114

"Little Wonder" Nibbler

Portable "Little Wonder" nibbler brought out by the Fenway Machine Co., Philadelphia, Pa. Will cut 14-gage cold-rolled steel or galvanized iron, 16-gage stainless steel, and softer materials in proportionally heavier gages. Cuts

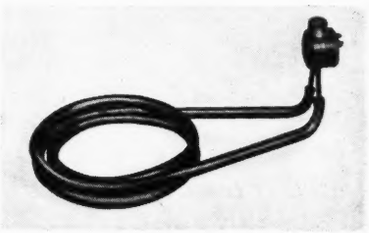


are made without distortion. Has a high-strength, light-weight aluminum frame, anti-friction bearings, hardened precision gears, and universal motor for operation either on 15-volt direct current or 60-cycle alternating current. 115



Optical Cam Rise Gage for Measuring Cam Angles and Contours

Cam rise gaging device designed to simplify and speed up accurate measurement of cam contours (both angle and amount of eccentricity) by optical means. The deviation in a cam surface at any angle of arc, from minimum to maximum radius, can be quickly measured to ten-thousandths inch. Reading is direct at normal eye distance, no focussing being necessary. For angular measurements, the cam rise gage is used with a dividing head and tailstock to position the cam. Direct readings can be made to 0.0005 inch, and movements as small as 0.00025 inch can be easily and accurately estimated. Announced by F. T. Griswold Mfg. Co., Wayne, Pa. 116



G-E "Calrod" Immersion Heaters

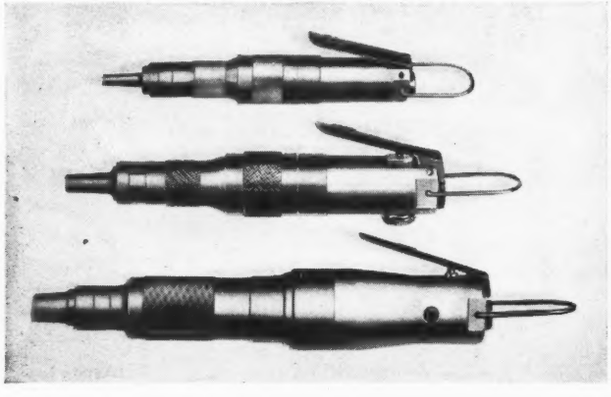
"Calrod" immersion heaters for nickel- and copper-plating baths and for mild sulphuric-acid and chrome-plating baths have been announced by the Industrial Heating Department of the General Electric Co., Schenectady, N. Y. Greater flexibility and portability have been incorporated in these units by replacing the old style sealing cup with a new junction box or terminal housing which is vapor-tight. These units also reduce the possibility of faulty connections. The terminals are readily accessible by removing the housing cover. 117

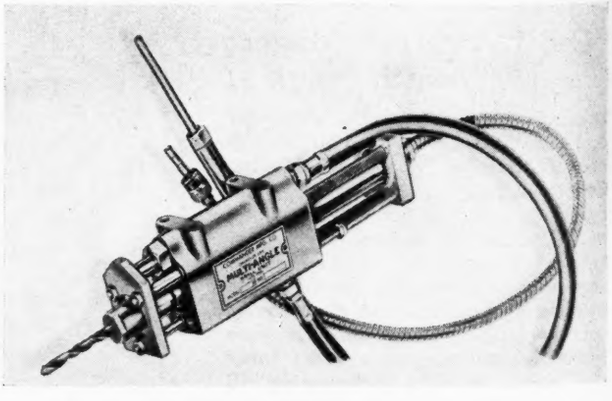
Ingersoll-Rand Air-Operated Screwdrivers

Three basic sizes of new cushion-clutch air-operated screwdrivers designed for general manufacturing operations in automotive, aircraft, and other fields using screw-fastened assemblies. The cushion clutch consists of two units—an engaging clutch and a torque limiting clutch. The engaging clutch enables the screwdriver to be used continuously without stopping motor, only a slight forward pressure on the tool being necessary to rotate the bit. The ball type torque limiting clutch permits adjustment for precise torque control, and enables the operator to drive all screws to the same degree of tightness. This design is noted for absence of rotary impact, a feature that helps maintain accurate torque settings. Reversible and non-reversible models are included in the line. Complete line includes thirty-eight sizes. Placed on the market by the Ingersoll-Rand Co., New York City. 118

Multi-Angle Drill Unit

Drill unit designed to provide unlimited freedom of set-up in order to simplify and reduce the cost of drilling holes at any angle. Recently announcd by the Commander Mfg. Co., Chicago, Ill. This unit is driven by a heavy-duty flexible shaft, with hydraulic actuation of the full 4-inch stroke. Because of their compact design, a number of these multi-angle units can be mounted on a jig or fixture for drilling multiple holes in a single piece. 119





To obtain additional information on equipment described here, use Inquiry Card on page 229.

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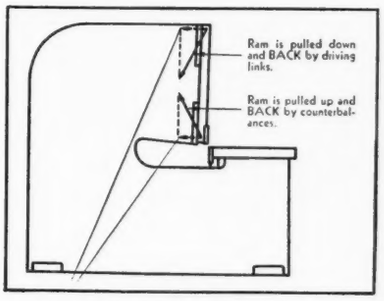
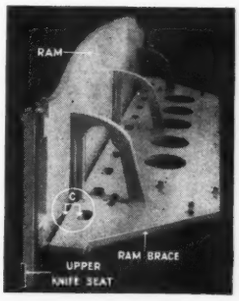
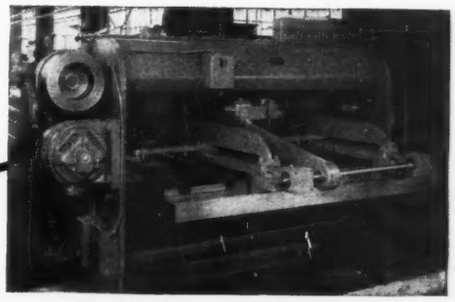


Cincinnati Non-Float Ram



Cincinnati Sure-Set Knife Aligner

Cincinnati Hydraulic Holddowns



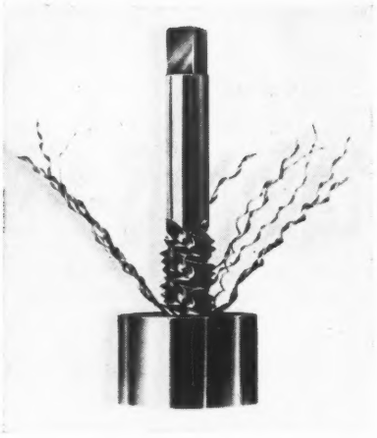
Cincinnati Magnetic Sheet Support

Just off the press This up-to-the-minute, illustrated catalog will give you a complete description of the speedy, accurate All-Steel Cincinnati Shears in capacities from 12 gauge to 1¼-inch steel plate, in 4-foot to 24-foot lengths. Also, many special features for particular needs are illustrated and described.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Left-Hand Thread-Cutting Broach

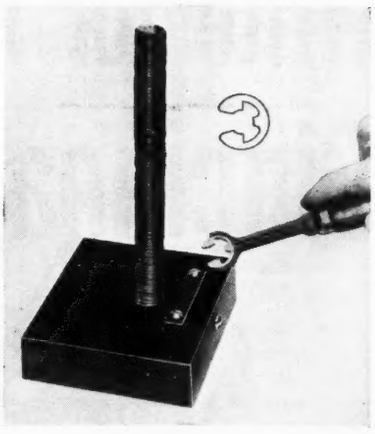
"Shearcutter" thread-cutting broach for cutting left-hand threads. This new tool generates or forms a perfectly threaded hole by a true broaching action. Chips removed by this tool are curled up in one piece and flow out of the hole being threaded, thus preventing tool breakage due to clogging by the chips. Available in all popular sizes of both right-hand thread and the new left-hand thread cutting type. Manufactured by the Shearcut Tool Co., Reseda, Calif. ..120

Combination Tool-Suspension and Air-Supply Hose Reel

Combined tool-suspension and air-supply hose reel for installation over a work-bench on high-speed production assembly lines. A pneumatic screwdriver or other tool can be suspended on the hose that supplies the air. The weight of the tool is counterbalanced by the spring tension of the reel. Supplied with 15 feet of hose having an inside diameter of 1/4 inch, and standard fittings. Product of the Wayne Pump Co., Fort Wayne, Ind. 121

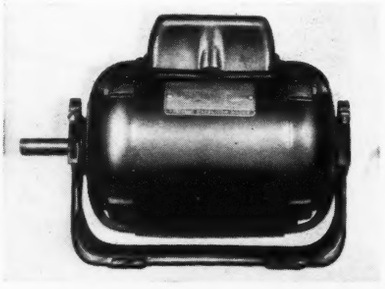
Allen-Bradley Reversing Drum Switch

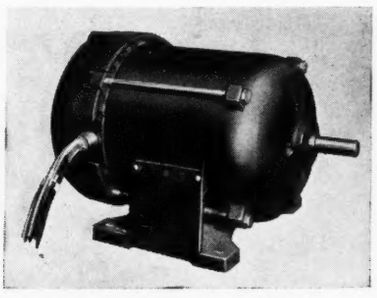
Compact reversing drum switch suitable for a wide variety of mounting arrangements in small work-shops and industrial services. This new switch is the equivalent of a three-pole double-throw switch. It is small and simply designed —for machines and equipment requiring an economical across-the-line starting and reversing switch for alternating- and direct-current motors rated at 2 H.P. or less. Typical applications include drilling machines, lathes, milling machines, and laboratory equipment. Product of Allen-Bradley Co., Milwaukee, Wis. 122



Stacked Open Type Retaining Rings

Stacked open type retaining rings and tool designed by Industrial Retaining Ring Co., Mount Vernon, N. Y., to reduce normal assembling time. This ring stack greatly decreases the time and motions required in selecting, untangling, and applying unstacked retaing rings, and eliminates the loss of rings. The tool is used by the operator in picking up a ring from the vertical stack and applying it. The retaining rings are made from carbon spring steel, and are designed to support heavy thrust loads and withstand vibration without displacement. They are made in sizes to fit shafts ranging from 1/8 to 3/4 inch in diameter. The rings range in thickness from 0.015 to 0.050 inch. 123

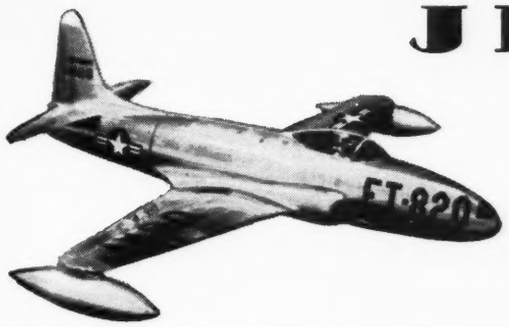




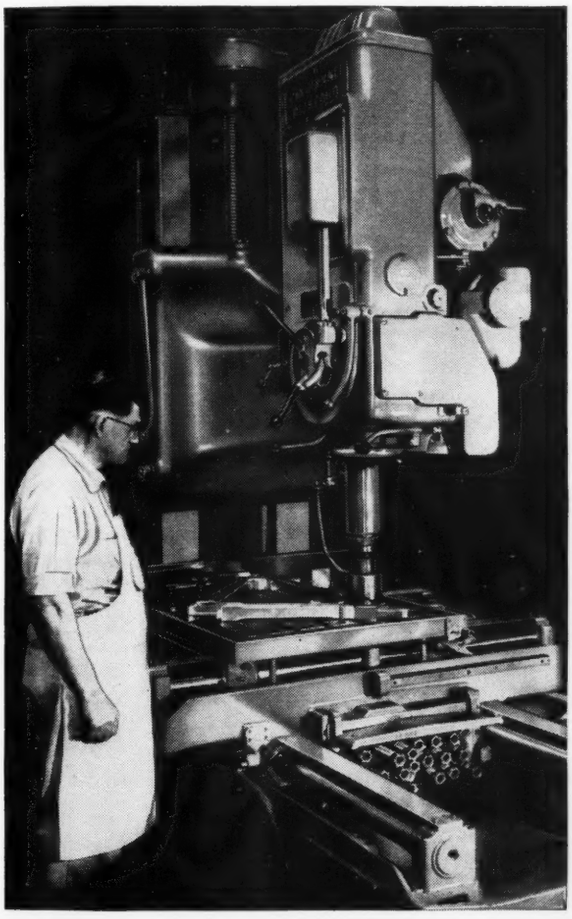
G-E Single-Phase Capacitor Motors of Resilient-Base and Totally Enclosed Fan-Cooled Designs

(Left) Single-phase capacitor induction motor with a resilient-base construction, for use where freedom from vibration and extra quiet operation are required. This is a recent addition to the "Tri-Clad" line of the General Electric Co., Schenectady, N. Y. These motors are made in 1/2- to 5-H.P. sizes. Except for the 5-H.P. size, which uses 230-volt current only, the new motors operate on 115- to 230-volt, 60-cycle power supply. Automatic reset thermal protective devices are available for use with the 1- and 5-H.P., 1800-R.P.M. sizes. (Right) Single-phase capacitor motor of totally enclosed fan-cooled construction—another recent addition to the "Tri-Clad" line. Features include starting capacitors and switch mounted within the motor frame to provide maximum protection with minimum space requirements. Developed for use where unusually severe conditions of dirt, grit, or moisture are encountered. Available in ratings of from 1 to 5 H.P. Also made in explosion-proof and dust-explosion proof construction. These motors operate on the same power supply as the resilient-base type. 124

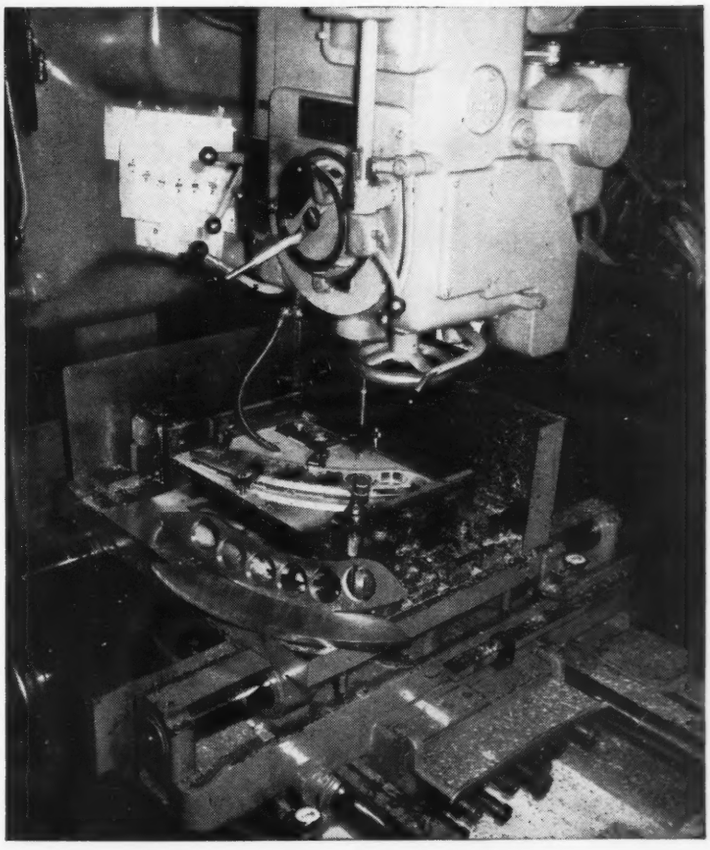
To obtain additional information on equipment described here, use Inquiry Card on page 229.



JIGLESS ACCURATE DRILLING



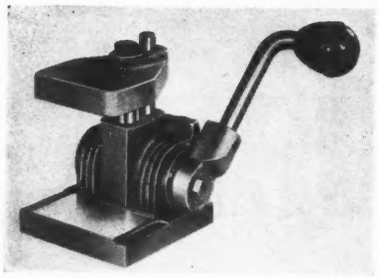
Precision production work without the use of jigs, at Lockheed, is now being accomplished on the Cincinnati Bickford PRECISION Drilling Machine, equipped with a Bullard Man-Au-Trol Spacer. A variety of production jobs, such as cutting holes approximately 3" in diameter, through curved plates of magnesium about ⅜" thick, are now being economically produced without the use of jigs. First, a 5/16" hole is used as a pilot hole for a fly cutter. The total tolerance on the diameter of the accurately located holes is .001". According to Lockheed, "Fast, repetitive drilling is handled without the use and expense of jigs — heavy parts including castings are automatically positioned under the jig boring type spindle — parts handling is minimized — storage and maintenance of drill jigs are eliminated."



Where repeated accuracy of hole spacing, drilling, reaming and tapping is to be economically facilitated, the combination of the SUPER SERVICE PRECISION Drilling Machine and the Bullard 30" x 20" Spacer is hard to beat. Not only is production speeded — there is no waiting for jigs to be made. You can get into production of vitally needed parts right away.

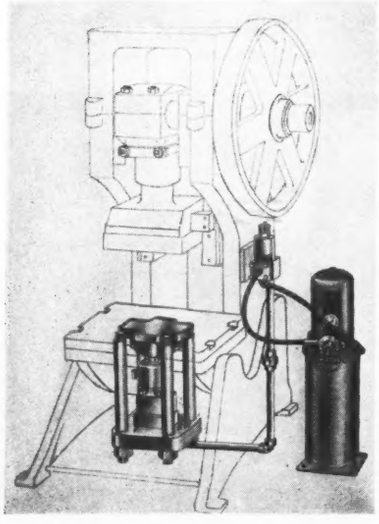
Ask the Cincinnati Bickford Tool Company, of Cincinnati 9, Ohio, or the Bullard Company, of Bridgeport 2, Connecticut, for further information about this natural combination.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.



Small Size Precision Drill Jig

Single-post "Esco Mijit" drill jig combining small size with accurate alignment and "touch-release" locking. Made by Esco Engineering Corporation, Detroit, Mich. This jig is recommended for drilling small parts required in limited and medium quantities, where fixtures and tooling costs must be held to a minimum. Interchangeable adapters and bushing plates facilitate quick, economical change-over from one job to another. Base and top plate are accurately machined, as is the back of the base, for use in either a horizontal or a vertical position. 125

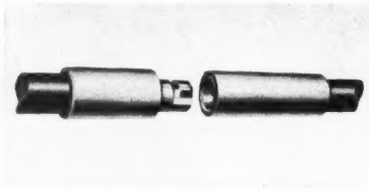


Hydraulic Overload Safety Press Bed Jack

Improved hydraulic press bed jack that can be fastened directly to the bolster plate or bed frame of a press. This safety device is a development of the Dayton Rogers Mfg. Co., Minneapolis, Minn. It consists of a hydro-pneumatic pumping unit which can be operated directly from the average shop air line; and a control valve which can be set at any desired tonnage. The control valve gives the press the required overload protection, and also can be so adjusted as to give the tools being used overload protection. This safety equipment can be used to advantage on all such operations as riveting, marking, stenciling, squeezing, assembling, forming, swaging, and staking. It is designed to assure constant working pressure at the point of operation, and will compensate for variations in the thickness of the part material. 126

Connector for Welding Cable

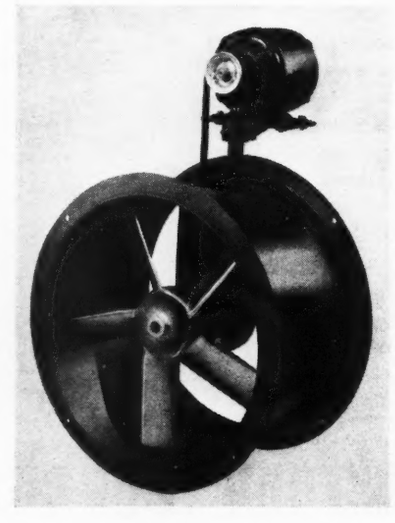
Improved connector for welding cable announced by Cam-Lok, Division of Empire Products, Inc., Cincinnati, Ohio. The connector is made of solid brass, and is machined to a smooth sliding fit. The design is based on a double cam principle, in which one cam exerts pressure parallel to the axis of the connector, while the other cam exerts pressure perpendicular to the axis. Provides a contact pressure of nearly 600 pounds per square inch, as needed

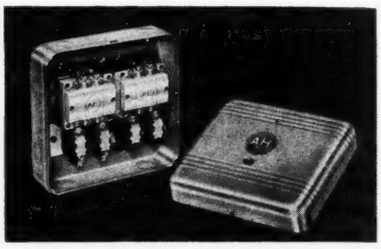


for minimum electrical resistance. Connector is self-compensating for wear, locks tight, releases easily, has no spring action, and reduces arcing and burning to a minimum. 127

Improved Spray Booth Fan

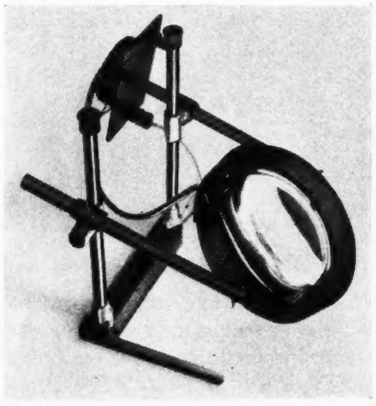
Paint-spray booth fan of improved design provided with double angle support on tube, which is said to result in less vibration and no twisting of tube by motor weight. Sealed SKF bearings are used with replaceable type flange mounting to insure longer bearing life and quieter operation, as well as to permit quicker servicing. Heavy cast aluminum fan blade is left full thickness to insure longer life and facilitate cleaning. Built to Underwriters' specifications for general application in areas requiring positive elimination of hazardous fumes and vapors, as well as for paint spray booths. The fan has an adjustable motor base. It is made in sizes with motors ranging from 1/4 H.P. for 18-inch fans up to 7 1/2 H.P. for 42-inch fans. Made by Standard Electric Mfg. Co., West Berlin, N. Y 128





Arrow-Hart Starters for Reversing and Multi-Speed Motors

The Arrow-Hart & Hegeman Electric Co., Hartford, Conn., has added two new types to its line of magnetic starters. The new RAR reversing type and the RAS multi-speed type have the patented Arrow-Hart "right angle" operating mechanism. Among other advantages claimed for this design are greatly reduced size and weight; increased operating efficiency; simplified straight-through front wiring; and more complete protection of electromotive equipment. Supplied in sizes 0, 1, 2, 3, and 4 to meet a wide variety of uses. ..129



Large Inspection Lens Equipped with Floodlight

Colorama lens with 12-inch field and equipped with 400-foot candle light source for inspection and assembly work. Color filters relieve eye fatique, and the lens is protected from scratching by using tempered casehardened glass. Universal adjustment is provided by flexible base brackets. Product of the McMahill Colorama Co., Cleveland, Ohio. 130

To obtain additional information on equipment described here, use Inquiry Card on page 229.

Between Grinds

By E. S. Salichs

A Mouseful

How would you like to play around with the "Mead 'Mighty Mouse' Tractor equipped with the Mott Hammer Knife Mower Attachment"?

Math Not for the Mass

A symposium to discuss the Monte Carlo Method was arranged some time ago by applied mathematics scientists, and now the National Bureau of Standards has published the results in a bulletin entitled "Monte Carlo Method"—a method which "involves an interesting combination of sampling theory and numerical analysis" and is described as "the device of studying an artificial stochastic model of a physical or mathematical process." So now you may peruse the proceedings in black and white. On a visit outside the country we did some sampling of our own, sitting in on a Monte Carlo symposium and studying a black and red rotating device—but we couldn't find the winning combinations.

Matches Hole in One

The editor who handles our Materials of Industry department received in his mail a sample hard wood (lignum vitae to you) disc. He fished out of his pocket a washer, examined closely the center hole of the washer and of the disc, and decided the sample was just what he needed to fix his wife's washing machine.

Geronimo!

Professor Rafael Duenas Geronimo writes us from Barcelona and rustling up our Spanish we translate literally if awkwardly what the good professor says: "Having read with great interest MACHINERY—your wonderful magazine—for the month of July, and which from month to month brings most interesting articles, due to the great variety of machinery, ideas and engineering projects, and which to me is of greatest interest, and through the means of which I instruct the students in my school shops its magnificent construction and improvements in modern fabrication." We lost the grammatical structure of a complete sentence somewhere along the line, but we stayed with the thought.

MATERIALS HANDLING BY MIKE—The dispatcher talking to the straddle truck seen through the window, directs a fleet of twenty-four mobile units at the Steel and Tube Division plant of the Timken Roller Bearing Co., Canton, Ohio, as a result of the installation of a two-way radio system. From near and far in the yards, locomotive cranes, fork trucks, straddle trucks, and jeeps talk back and then speed away to new assignments

News OF THE INDUSTRY

California and Utah

HANNA ENGINEERING WORKS, Chicago, Ill., has appointed the SWEETLAND-AFFLECK CORPORATION exclusive dealer for Hanna pneumatic and hydraulic cylinders and control valves in central and southern California. The Sweetland-Affleck office covering the southern California territory is located at 940 N. Fair Oaks, Pasadena, while the headquarters for central California are located at 405 Montgomery St., San Francisco.

SONNET SUPPLY CO., 580 N. Prairie Ave., Hawthorne, Calif., has been appointed West Coast distributor for the GORHAM TOOL CO., Detroit, Mich.

LINK-BELT CO., Chicago, Ill., has opened a new factory branch store at 108 S. Fourth West St., Salt Lake City, Utah. DONALD W. NEWSOME is in charge.

Illinois and Indiana

J. W. GOOCH has been appointed assistant plant manager by the DoAll Co., Des Plaines, Ill., in charge of manufacturing operations in the production of the company's line of band tools, which has recently been expanded to include cutting tools, gage-blocks and accessories, and industrial supplies. From 1940 to 1948, Mr. Gooch was connected with the company as general manager in charge of operations in saw manufacturing. At the end of that period, he joined the Leader Electric Co., Chicago, Ill., manufacturer of lighting fixtures, to become general manager of operations, which position he has resigned to return to the DoAll Co.

SUNDSTRAND MACHINE TOOL CO., Rockford, Ill., has begun construction on a $700,000 addition to its manufacturing plant in order to provide space for increased defense production and to segregate government production from the company's commercial manufacture of transmissions, pumps, and accessories. The new building is expected to be ready for use by next summer, and will provide 85,000 square feet of additional floor space.

ROBERT C. BECHERER has been elected executive vice-president of the Link-Belt Co., Chicago, Ill. Mr. Becherer was made general manager of the company's Ewart plant in Indianapolis, Ind., in 1947, and became a vice-president last year. RICHARD E. WHINREY, who was assistant general manager at the Ewart plant, has been promoted to general manager, succeeding Mr. Becherer.

ELGIN NATIONAL WATCH CO., Elgin, Ill., has announced the organization of a new Abrasives Division, which will handle all Dymo diamond abrasive materials and a line of accessories for fine finishing operations. C. R. MYER will be manager of the new division, JOHN F. IRELAND will direct sales, and D. H. PRENTICE will act as technical director.

DOALL CO., Des Plaines, Ill., has recently appointed the following general managers at the company's sales-service stores: JOHN B. REICHLE, Toledo, Ohio; HENRY SOKOL, Detroit, Mich.; KURT G. KREBS, Grand Rapids, Mich.; and CLAYTON C. CLEGG, Pittsburgh, Pa.

O. J. MAAG has been appointed sales manager of the Janette Mfg. Co., Chicago, Ill., manufacturer of motors, speed reducers, and generators, and F. C. HARTMANN has been made assistant sales manager.

WELDIT, INC., Detroit, Mich., has appointed CLIFFORD L. SCHUELTZ & Co., 4637 N. Knox Ave., Chicago 30, Ill., distributors of Weldit equipment and Tipaloy resistance welding electrodes in the Chicago area.

JAMES H. INGERSOLL, assistant to the president of the Ingersoll Products Division of the Borg-Warner Corporation, Chicago, Ill., has been elected vice-president of the Division.

PAUL E. WILSON, 2636 S. Michigan Ave., Chicago 16, Ill., has been appointed representative for the line of air and hydraulic cylinders made by the Hydro-Line Mfg. Co., Rockford, Ill.

JOHN F. ANSINK, general manager of the Round Chain & Mfg. Co., Chicago, Ill., has been elected vice-president of the company.

ELKHART TOOL & ENGINEERING have changed their name to the LEWIS MFG. CO., and have opened a new office and factory at 1045 N. Nappanee St., Elkhart, Ind.

Massachusetts and Connecticut

FRANK ZACHER was recently named director of personnel for the Norton Co., Worcester, Mass. Mr. Zacher, who was formerly supervisor of factory training, will be responsible for the personnel functions of both the Abrasive and Grinding Machine Divisions. Announcement has also been made of the appointment of OLAVI J. WARPULA as resident demonstrator at Detroit, Mich., for the Grinding Machine Division of the company, replacing GEORGE B. TAFT, who retired some months ago.

JOHN C. EWER has been appointed managing director of the Norton Grinding Wheel Co., Ltd., Welwyn Garden City, Herts, England. Mr. Ewer joined the abrasive division of the Norton Co., Worcester, Mass., in 1934, and five years later became an abrasive engineer, the position he held in this country until his promotion last year to assistant general manager of the company's English branch.

DONALD F. WARNER has been named assistant to the manager of engineering for the General Electric Co.'s Turbine Department, and will be located at the Lynn River Works, Lynn, Mass. J. HERBERT BEHM has been appointed staff assistant to the manager of engineering in the Small Apparatus Division, with headquarters also at Lynn.

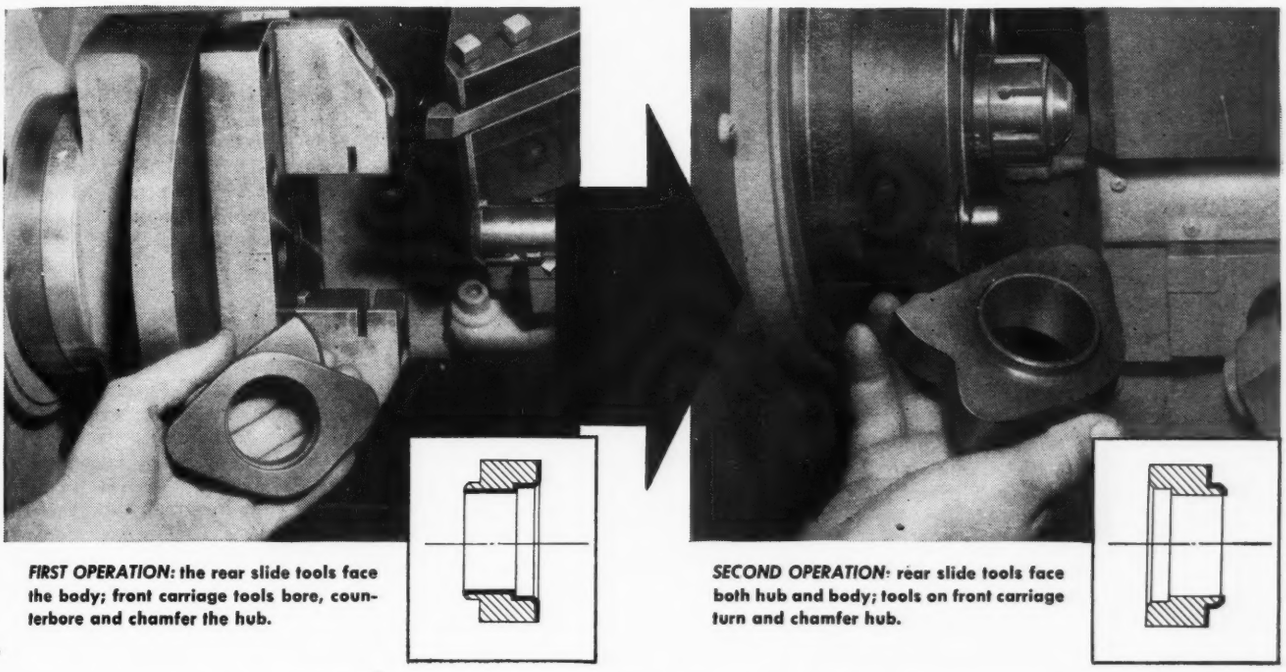
JAMES H. WOLCOTT has been appointed sales manager of the Machinery Division of the Reed-Prentice Corporation, Worcester, Mass. Mr. Wolcott, who has been with the concern since 1937, will supervise sales activities covering machine tools, plastic injection molding machines, and die-casting machines.

BRIDGEPORT BRASS CO., Bridgeport, Conn., has announced that it will go into the aluminum business, supplementing its regular lines of brass and copper mill products. This expansion has been made to help meet the need for aluminum products in connection with the defense program.

REED ROLLED THREAD DIE CO. has moved into its new plant in Worcester, Mass. The mailing address is Box 350, Worcester 1, Mass.

Quick "pass-along" idea

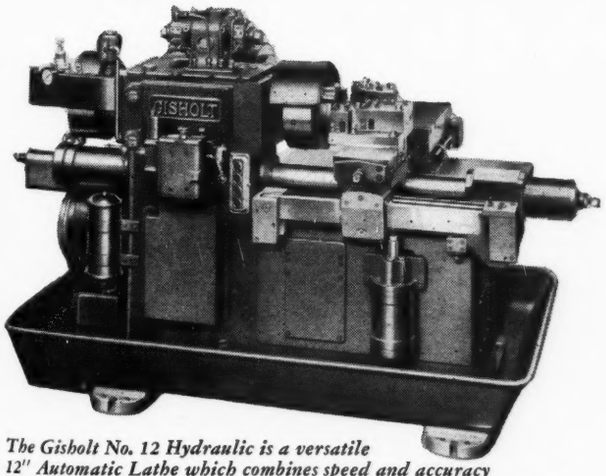
INCREASES PRODUCTION



FIRST OPERATION: the rear slide tools face the body; front carriage tools bore, counterbore and chamfer the hub.

SECOND OPERATION: rear slide tools face both hub and body; tools on front carriage turn and chamfer hub.

with pair of GISHOLT No. 12 Hydraulic Automatic Lathes



The Gisholt No. 12 Hydraulic is a versatile 12" Automatic Lathe which combines speed and accuracy with easy setup. Ideal for both chucking and between-centers work.

One operator with two standard machines now handles these cast iron manifold bodies in rapid succession—at a pace of 80-per-hour, at 80% efficiency.

This two-machine team pays off many ways: The operator loads and unloads one machine while the other is working—*automatically.* Investment is at a minimum because both machines *and* tooling are standard. Tool setups and replacements are simple.

Whether you have continuous runs like this or even smaller job lot work—the speed and automatic operation of the Gisholt No. 12 Hydraulic may be your answer to lower costs. It's worth investigating.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Michigan

NATIONAL BROACH & MACHINE CO., Detroit, Mich., manufacturer of gear finishing and inspection machines, broaches and broaching fixtures, and special production machines, has just moved its administration offices and engineering department into a new building at Shoemaker and St. Jean Ave. in Detroit. The new quarters provide 24,000 square feet of additional floor space. The space formerly used for offices and engineering is now being employed for manufacturing purposes.

EATON MFG. CO. announces the promotion of the following three men in the Spring Division of the company at Detroit, Mich.: F. I. GOODRICH, general manager, to succeed W. H. Wallace, who died recently; E. H. LINDEMAN, assistant general manager in charge of leaf springs; and H. H. CLARK, assistant general manager in charge of coil springs.

WELDIT, INC., 990 Oakman Blvd., Detroit, Mich., has been appointed national distributor for Tipaloy resistance welding electrode by TIPALOY, INC., of Detroit.

RUDOLPH J. LESNIK has been appointed chief engineer of the Gorham Tool Co., Detroit, Mich. Prior to his present appointment, he held the position of chief draftsman.

Missouri and Iowa

FEDERATED METALS DIVISION, AMERICAN SMELTING & REFINING CO., New York City, has announced the purchase of the Frictionless Metal Co. of St. Louis, Mo., manufacturer of frictionless bearing metal. The Division has transferred manufacturing operations to its St. Louis plant.

E. W. BLISS CO., Canton, Ohio, has appointed the IOWA MACHINERY & SUPPLY CO., Des Moines, Iowa, sales representative for Bliss mechanical and hydraulic presses in the central portion of Iowa.

New Jersey

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J., has announced the following promotions: GEORGE P. PASSMORE, works manager of the Wellsville, N. Y., plant, has been appointed assistant to the vice-president in charge of manufacturing, at Harrison; A. M. TULLO, assistant works manager at the Harrison plant, has become works manager of the Wellsville plant; and GEORGE F. HABACH, chief engineer of the Centrifugal Engineering Division, has been made executive engineer at the Harrison plant.

WATSON-STILLMAN CO., Roselle, N. J., announces the following promotions: ROBERT WRIGHT, purchasing agent; WILLIAM DONNER, assistant buyer; and PAUL ANDERSEN, buyer of finished products. FREDERICK BRADFORD has joined the company as rough materials buyer, replacing JOHN FEEHAN, who recently resigned.

New York

GENERAL ELECTRIC CO., Schenectady, N. Y., announces the following appointments: C. HOWARD BLACK has been named general manager of the Meter and Instrument Department at Lynn, Mass.; F. CHARLES RULING has been appointed manager of the Atlantic district of the Apparatus Sales Division, with headquarters in Philadelphia, Pa.; JAMES J. FITZGIBBON has become manager of the apparatus sales office in Washington, D. C., filling Mr. Ruling's former position; and RALSTON B. REID has been named assistant manager of the advertising and sales promotion department of the Apparatus Marketing Division.

ROBERT S. STRAWSBURG has been appointed district manager of the Buffalo office of the Warner & Swasey Co., Cleveland, Ohio. Mr. Strawsburg was European resident field engineer for the company with headquarters in Paris from 1948 to 1950. He returned in January of this year to the East Orange office, where he had been located prior to his European assignment.

JOHN W. BELANGER and NICHOLAS M. DUCHEMIN have been elected vice-presidents of the General Electric Co., Schenectady, N. Y. Mr. Belanger was also appointed general manager of the company's newly created Defense Products Division. Mr. DuChemin was placed in charge of the Manufacturing Services Division.

A. E. CRIPPS, INC., 55 W. 42nd St., New York 18, N. Y., has been organized by A. E. Cripps, formerly eastern export sales director for the A. O. Smith Corporation, Milwaukee, Wis., to act as an export sales department for a group of manufacturers in the engineering, industrial, and mill supply fields.

CARL HIRSCHMANN CO., Manhasset, N. Y., has been appointed exclusive U. S. representative for LIENHARD & CO., La-Chaux-de-Fonds, Switzerland, manufacturer of high-precision engraving machines, pantographs, and similar equipment.

Ohio

ARO EQUIPMENT CORPORATION, Bryan, Ohio, has purchased PYLES INDUSTRIES, INC., Detroit, Mich., manufacturer of heavy-duty pumps, metering devices, flow guns, and special equipment for handling industrial lubricants. The new company will be known as PYLES INDUSTRIES, INC., SUBSIDIARY OF ARO EQUIPMENT CORPORATION. GEORGE S. PYLES will continue as president of the company, which he founded, and R. W. MORRISON will be vice-president. Manufacturing facilities and sales offices will remain at Detroit.

WILLIAM IRRGANG was recently elected executive vice-president of the Lincoln Electric Co., Cleveland, Ohio. Mr. Irrgang started with the company in 1929, and for the last six years has been director of plant engineering. L. K. STRINGHAM, who has been serving as director of welding development for the company, has been appointed chief engineer.

(Left) William Irrgang, newly elected executive vice-president of the Lincoln Electric Co. (Right) L. K. Stringham, chief engineer

JOHAN A. MULLER has joined the Lewis Welding & Engineering Corporation, Bedford, Ohio, as head of a new development department. The concern recently acquired all rights to the sale and manufacture of a plastic injection molding machine, and Mr. Muller will devote himself chiefly to the development of that equipment.

OHIO CRANKSHAFT CO., Cleveland, Ohio, has started building a new plant on 71st St. in Cleveland to be occupied by the Tocco Division, which manufactures high-frequency heat-treating equipment. According to the company's plans, the building will house the largest induction heating laboratories in the world. They will be used to expand current projects and develop new applications.

C. W. TITGEMEYER, vice-president of the Osborn Mfg. Co., Cleveland, Ohio, recently celebrated his forty-fifth anniversary in the employ of the company. Mr. Titgemeyer, who started as an office boy with the company when he was sixteen years old, was presented with a gold wrist watch, in recognition of his years of service.

RELIANCE ELECTRIC & ENGINEERING Co., Cleveland, Ohio, recently added the following men to its purchasing department: NOLAN B. BARNARD, JAMES H. HIMES, MORLEY HITCHCOCK, and WILLIAM F. SIMMONDS.

SAMUEL P. OWEN has been appointed advertising manager of Rockwell Tools, Inc., Columbus, Ohio, a firm that was recently acquired by the Rockwell Mfg. Co. Mr. Owen was formerly associated with Marsteller, Gebhardt & Reed, Inc., Chicago, Ill., advertising agency for all divisions of the Rockwell Mfg. Co.

Samuel P. Owen, recently appointed advertising manager for Rockwell Tools, Inc.

Paul W. Arnold, executive assistant to the sales vice-president of the Reliance Electric & Engineering Co.

PAUL W. ARNOLD, manager of product sales for the Reliance Electric & Engineering Co., Cleveland, Ohio, has been advanced to the newly created post of executive assistant to the sales vice-president. RICHARD A. GEUDER, who has headed the company's application engineering work since 1944, has been made manager of a new department of applied engineering and industry sales.

MALVERN J. HILER, executive vice-president of the Commonwealth Engineering Co. of Ohio, Dayton, Ohio, was recently made president of the company.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has moved its executive and plant offices into a new $10,000,000 plant at 22801 St. Clair Ave., Cleveland 17, Ohio. This was the final step in the removal of the machine division into the new plant.

Pennsylvania and Maryland

RITE-WAY TOOL CO. has been organized by OLIVER B. SCHMELTZ and THOMAS M. REES of the Rees Machinery Co., Pittsburgh, Pa., to market standard and special metal-cutting tools and machine tool accessories. The headquarters of the company are at 1612 Potomac Ave., Pittsburgh, Pa. GLENN R. KRAUS and ELMER E. HAFENBRAK will represent the new company in the Tri-State area.

WARDEN F. WILSON has been elected president and general manager of the Donegal Mfg. Corporation, Marietta, Pa., producer of carbon steel, and low- and high-alloy steel castings. Mr. Wilson was previously general sales manager of Lebanon Steel Foundry, Lebanon, Pa. At the same time as Mr. Wilson was made president of the Donegal concern, he was elected a director.

A. L. LENTZ has been appointed sales manager for the Wm. K. Stamets Co., Pittsburgh, Pa., distributor of machine tools and manufacturer of special machinery. Mr. Lentz was formerly Pittsburgh representative of the Cincinnati Milling Machine Co.

E. L. PARKER recently resigned his position as president of the Columbia Steel & Shafting Co., Carnegie, Pa., and subsequently was elected chairman of the board. GEORGE E. PARKER, vice-president in charge of operations of the plant at Carnegie since 1947, was elected president of the company.

S. A. ANGOTTI has been appointed assistant secretary of the Landis Tool Co., Waynesboro, Pa. Mr. Angotti comes to Landis from the Fairchild Aircraft Division, Hagerstown, Md., where he was director of industrial relations.

OTTO F. BENDER has been appointed district sales manager in the Philadelphia area for the Woodhouse Chain Works, Trenton, N. J. His headquarters will be at 1326 Western Saving Fund Bldg., Philadelphia, Pa.

JOHN C. SEARS has been appointed executive secretary of the American Gear Manufacturers Association, Pittsburgh, Pa., succeeding NEWBOLD C. GOIN, who resigned October 1. For the last six years, Mr. Sears has been on the staff of American Associated Consultants, Inc., New York City, and manager of the Cooperative Wage Bureau maintained in Pittsburgh by the steel industry.

John C. Sears, new executive secretary of American Gear Manufacturers Association

Eric C. Brodin, newly elected vice-president of S K F Industries, Inc.

ERIC C. BRODIN has been elected a vice-president of S K F Industries, Inc., Philadelphia, Pa. Prior to his promotion, Mr. Brodin was assistant vice-president in charge of manufacturing research; he will now be in charge of the company's manufacturing development.

FRANK A. VOTTA, JR., has just been appointed chief engineer of the Hunter Spring Co., Lansdale, Pa. Mr. Votta has been associated with the company since 1941, and has been engineer in charge of the company's Neg'ator Division for the last two and one-half years.

JOHN F. SPAULDING has been appointed sales manager of the Black & Decker Mfg. Co., Towson, Md., manufacturer of portable electric tools. He succeeds GLEN H. TRESLAR, who was recently promoted to the position of vice-president in charge of sales. Mr. Spaulding has been manager of the company's Buffalo branch since 1931.

John F. Spaulding, new sales manager of the Black & Decker Mfg. Co.

Texas and South Carolina

DON BALFOUR has joined the Texas Engineering & Mfg. Co., Inc., Dallas, Tex., as factory manager, succeeding O. E. WITBECK, who recently resigned his position. Prior to this appointment, Mr. Balfour was plant superintendent of the Avco Mfg. Co. at Nashville, Tenn.

VEEDER-ROOT, INC., Hartford, Conn., manufacturer of counting and computing devices, has begun construction of a new sales and service building in South Carolina, which will replace the present offices at 231 W. Washington St., Greenville, S. C.

Wisconsin

J. W. SPOOR has been named general sales manager of the Welding Products Division of the A. O. Smith Corporation, Milwaukee, Wis. L. F. VONIER, former sales manager, has been appointed to the newly created position of sales promotion manager. Mr. Spoor was previously manager of the Product Service Division, and is succeeded in that post by CHARLES SMITH, formerly field service manager.

TWIN DISC CLUTCH CO., Racine, Wis., has created two new vice-presidencies and has announced the following appointments to fill the positions: G. L. SHUMAN, vice-president, finance, and secretary; and R. G. DELONG, vice-president, Hydraulic Division, at Rockford, Ill. W. F. SHURTS, who has been chief engineer of the Hydraulic Division since 1942, is now director of engineering.

BANNER MFG. CO., manufacturer of resistance welding equipment, has moved from N. 29th St., Milwaukee, Wis., into its new plant at 6820 N. 43rd St.

CHARLES H. BESLY & CO., is building a new plant in South Beloit, Wis., to house both the machine tool and cutting tool divisions of the company.

* * *

According to the American Gear Manufacturers Association, business in the gearing industry increased by 11.7 per cent in September, 1951, compared with August, 1951. The index figure for September is computed to be 630.1.

Booklet on Defense Production Available

A 52-page booklet based on defense production experience gained during World War II and supplemented with the latest manufacturing and processing techniques is being distributed by E. F. Houghton & Co., manufacturer of metal processing aids, industrial lubricants, and packings.

Entitled "Defense Production Data from the Houghton Line," it covers the heat-treating and metal-working operations involved in producing shells, rockets, guns, ammunition, aircraft parts, tank parts, and other defense items. The publication has been designed as a guide for metal-working plants that are now changing over from industrial to defense production. Plants entering defense work for the first time or those having inexperienced personnel will benefit from this record of experience.

Many manufacturing steps are explained in detail. Heat-treating setups and quenching systems designed for particular applications are described, along with operational procedures to provide maximum production. Other topics covered are drawing operations, including the new cold extrusion of steel; machining; metal cleaning; and rust preventives.

Because of the limited supply, distribution of the booklet is restricted to metal-working plants filling defense orders. Such companies can obtain copies by writing to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

* * *

Pangborn Holds Open House

The Pangborn Corporation, Hagerstown, Md., manufacturer of blast cleaning and dust control equipment, held its first full-scale Open House on September 26, during which all operating and administrative departments were in full operation. Guides took groups through the entire plant, where they saw not only the fabrication of blast cleaning and dust control equipment, but also visited engineering, accounting, sales, and other departments.

A new demonstration room showed how Pangborn blast cleaning and dust control equipment operates. In this room, one machine of each type manufactured is shown in operation, just as if it were in a customer's plant, and typical castings, dies, and parts are processed.

* * *

There are approximately fifteen motor vehicles for every mile of road in the United States, and about one mile of road for every square mile of area.

Obituaries

William F. McCarthy

William F. McCarthy, for many years manager of the Boston office and later general manager of Henry Prentiss & Co., Inc., New York City, one of the most important distributors of machine tools in the East before the company went out of the machine tool business, died on September 15 in New York City. He was seventy-nine years old. Mr. McCarthy was one of the founders of the American Machine Tool Distributors' Association, had been president of the Association in 1934-35, and was on the executive committee as past-president for many years. He had been retired from business for some time.

William F. McCarthy

HENRY H. ERKELENZ, retired vice-president of the Harnischfeger Corporation, Milwaukee, Wis., died on October 6 in Milwaukee after a short illness. He was seventy-two years of age. Mr. Erkelenz was born and educated in Germany, and spent eight years in Scotland and England as an electrical engineer. In 1911, he joined the engineering department of the Harnischfeger Corporation, and, after various promotions through the years, was elected vice-president in charge of engineering in 1943. He retired two years ago. Surviving are his wife and son.

ERWIN HUBER, founder and president of the Topflight Tape Co., York, Pa., died on August 17 in Baltimore, Md., at the age of sixty-five years. In 1943, Mr. Huber founded the Topflight Tool Co., Inc., which specializes in aircraft production tools and is parent company of the Topflight Tape Co. About a year ago, he turned the direction of the two companies over to his son, Erwin W. Huber.

THOMAS L. LORD, former president of the C. F. Pease Co., Chicago, Ill., died on September 16 after a heart attack while at his summer home in Ephraim, Wis. He was seventy-one years old. Mr. Lord joined the C. F. Pease Co. in 1910 as director and treasurer, and twelve years later, became president, which office he held until his retirement in 1945.

Coming Events

NOVEMBER 1-4—Convention of the NATIONAL TOOL AND DIE MANUFACTURERS ASSOCIATION at the Statler Hotel in St. Louis, Mo. Executive Secretary, George S. Eaton, 1412 Union Commerce Bldg., Cleveland 14, Ohio.

NOVEMBER 8-9 — Seventh annual NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS at the Sherman Hotel, Chicago, Ill. Sponsored by the Graduate School of Illinois Institute of Technology and Armour Research Foundation of the Institute. Director of Public Relations, James W. Armsey, Illinois Institute of Technology, Chicago 16, Ill.

NOVEMBER 14-16—Fifty-second annual convention of the NATIONAL METAL TRADES ASSOCIATION (originally scheduled for September 26-28) at the Blackstone Hotel in Chicago, Ill. Further information can be obtained from Homer D. Sayre, Commissioner, 122 S. Michigan Ave., Chicago 3, Ill.

NOVEMBER 15-16—Seventh annual meeting of the MAGNESIUM ASSOCIATION at the Biltmore Hotel, New York City. Further information can be obtained by addressing the Association at 122 E. 42nd St., New York 17, N. Y.

NOVEMBER 25-30—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary, C. F. Davies, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 26-DECEMBER 1—Twenty-third EXPOSITION OF CHEMICAL INDUSTRIES at the Grand Central Palace in New York City. Charles F. Roth, manager, Grand Central Palace, New York 17, N. Y.

JANUARY 14-17, 1952—PLANT MAINTENANCE SHOW and PLANT MAINTENANCE CONFERENCE at Convention Hall in Philadelphia, Pa. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York City.

FEBRUARY 9-MARCH 24, 1952—INTERNATIONAL INDUSTRIAL MACHINERY EXPOSITION in Delhi, India. Further information can be obtained from Consulate General of India, 3 E. 64th St., New York 21, N. Y.

MARCH 11-14, 1952—Fifth NATIONAL PLASTICS EXPOSITION, sponsored by the Society of the Plastics Industry, Inc., to be held at Convention Hall, Philadelphia, Pa. Further information can be obtained from Langdon P. Williams, director of public relations, 67 W. 44th St., New York, N. Y.

MARCH 17-21, 1952—Ninth Biennial Industrial Exposition of the AMERICAN SOCIETY OF TOOL ENGINEERS at the International Amphitheatre, Chicago, Ill. Harry E. Conrad, executive secretary, 10700 Puritan Ave., Detroit 21, Mich.

MAY 22-24, 1952—Sixth annual convention of the AMERICAN SOCIETY FOR QUALITY CONTROL at the Onondaga County War Memorial, Syracuse, N. Y. Further information can be obtained from the Society, Room 5036, 70 E. 45th St., New York 17.

JUNE 23-27, 1952—Fiftieth anniversary meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotels Statler and New Yorker in New York City. Executive Secretary, C. L. Warwick, 1916 Race St., Philadelphia 3, Pa.

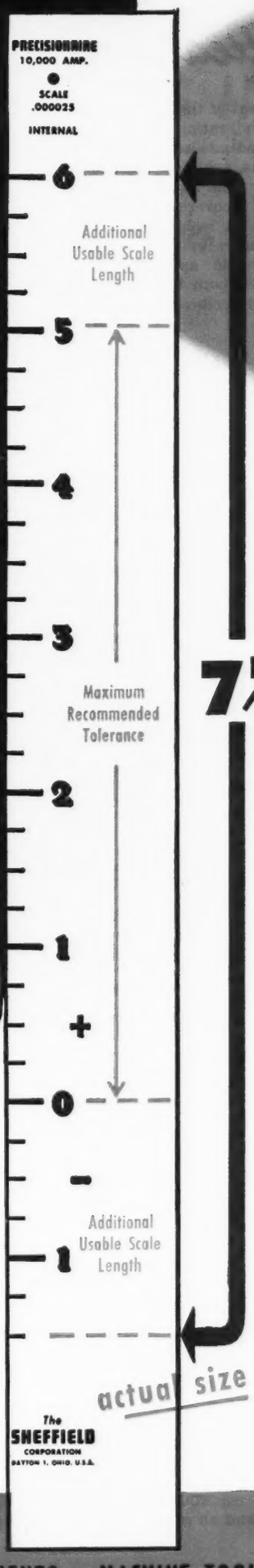
* * *

New Steel Warehouse Added to Frasse Facilities

A new steel warehouse of 80,000 square feet capacity has been opened by Peter A. Frasse Co., Inc., in Lyndhurst, N. J., for the distribution of alloy, stainless, and cold-finished carbon steels and tubing in the Metropolitan area and Connecticut. The building is constructed of steel and concrete. It is protected by a sprinkler system, and has an intercommunication system permitting instant contact with any work location.

The new warehouse provides 56- by 180-foot bays at each end for shipping and receiving. This permits loading and unloading of at least twelve trucks and four railroad cars simultaneously. Three 60-foot stock bays, together with an additional 24-foot storage area, are serviced by modern materials-handling equipment, including four overhead 5-ton cranes and a battery of Cranemobile boom trucks. There is a separate cutting and shearing bay.

Other facilities include electrically operated steel rolling doors and a straight-line materials-handling system designed to provide maximum speed and economy.



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CLOSER MACHINE CONTROL—with greater scale length the trend of the machine and tooling to go out of control *shows up sooner*, reducing possibility of rejects.

MORE ACCURATE QUALITY CONTROL CHARTS—the column Precisionaire scale is a running quality control chart in itself. Readings can be transferred to a chart with greatest accuracy.

OPERATORS LIKE THE LONG SCALE—with higher amplifications the spread for the tolerance and each classification is wider, making the operator's job easier.

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2,000	.0025	.0013
5,000	.001	.0005
10,000	.0005	.00025
20,000	.00025	.000125

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GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTRACT SERVICES • THREADING TOOLS

New Books and Publications

MACHINE DRAWING. By Deane Lent. 523 pages, 6 by 9 inches. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price, $7.75.

This book, written by assistant professor of engineering drawing at Massachusetts Institute of Technology, is designed to provide a comprehensive course in machine drawing, covering both elementary and advanced work, for use in engineering schools, technical institutes, and colleges.

The presentation follows the order of development of a machine—from the design through the assembly stages to the point of starting production. The subject matter is divided into three parts. The first section discusses the design phase of drawing, including such subjects as analysis and set-up of a design project; organized procedure of the design process; kinematic design and drawing; final form of the designer's layout; and patent rights.

The second part goes into the detail phase, covering technical sketching, auxiliary and partial views, sectional views, symbols and conventional representations, dimensioning, finished detail drawings, etc. One chapter contains a comprehensive description of manufacturing processes, a knowledge of which is essential to the detail draftsman who is to plan intelligently the construction of machines.

The third and final section treats of assembly drawings—methods of checking detail drawings; lay-out of an assembly drawing; techniques of making corrections, and similar subjects. This section also deals with the drawing of such standard parts as threaded fasteners, screws and bolts, washers, pipe, etc.

VIBRATION AND SHOCK ISOLATION. By Charles E. Crede. 328 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $6.50.

Protection of equipment and machinery by the use of resilient supports has developed to such an extent that the practicing engineer will welcome a complete treatment of the subject. This book, which is based on the author's many years of experience with vibration and shock isolators for the Navy Department and for industry, explains the mechanics of vibration and shock isolation and discusses the design and application of isolators.

The text is divided into six chapters, the first of which is introductory and discusses several mathematical and physical concepts of vibration isolation. The three following chapters treat of the fundamental principles of vibration and shock isolation, including non-linear and damped systems, practical aspects of damper designs, and sound isolation. The fifth chapter covers properties of materials used in isolators and the design of isolators employing these materials. Specific applications of isolating devices, both industrial and military, are described in the final chapter.

THE PRACTICE OF LUBRICATION. By T. C. Thomsen. 617 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $8.

This is an engineering treatise on the origin, nature, and testing of lubricants, as well as their selection, application, and use. Now in the fourth edition, it contains much new material covering the advance in the science of lubrication that has accompanied recent developments in the construction of engines and machinery involving higher speeds, higher pressures, and extremes of heat, as well as of cold.

Included in the new material is information on the manufacture of engine-oil additives, synthetic oils, lubrication of airplane engines and aircraft accessories, late developments in distillation and refinement of lubricants, employment of fabric bearings in steel mills, and the use of rubber, pressed metal, and fiber bearings. Numerous typical lubrication problems are analyzed, and an appropriate solution for each is pointed out.

The book should prove of interest to mechanical and electrical engineers in charge of plants; lubricating engineers; general consulting engineers; engine builders; and oil chemists and manufacturers.

THE ACTION OF CUTTING TOOLS. By A. J. Chisholm, J. M. Lickley, and J. P. Brown (No. 31 in the Yellow Back Series). 88 pages, 5 1/2 by 8 1/2 inches. Published by the Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. Sold in the United States by THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y. Price, 75 cents.

The four main groups of factors in machining that affect productivity—surface finish, tool forces and power, tool wear, and machine vibration—are discussed in this booklet, and the principles outlined are applied to single-point tools, twist drills, broaching cutters, taps and dies, milling cutters, and grinding wheels. In the final chapters, the theory of the economics of machining operations is dealt with, and an analytical study of practical machine conditions, with a view to increasing productivity, is presented.

THE SELECTION AND HARDENING OF TOOL STEELS. By L. H. Seabright. 263 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $5.

The purpose of this book is to classify all standard tool steels produced by companies in the United States and Canada into groups based on their properties and performance, in order to permit a quick, accurate selection to be made of the right steel for a given job. Accordingly, 960 analyses of tool steels, arranged in terms of their toughness and wear resistance, are classified into twelve main groups and forty sub-groups, or "types," in an introductory section.

Following this, complete data is presented on the heat-treating and tempering of the various types of steels listed. This material is divided into three parts covering water-hardening steels; oil- and air-hardening steels; and high-speed and hot-working steels. Included is information on such developments as "Martempering" and salt-bath quenching.

MACHINING OF STAINLESS STEELS. 27 pages, 8 1/2 by 11 inches. Published by the Metal Cutting Tool Institute, 3114 Chrysler Bldg., 405 Lexington Ave., New York 17, N. Y. Price, $1.

This pamphlet on the machining of stainless steels, which is especially timely because of the need for this information in the defense production program, was prepared by the Engineering Committee of the Metal Cutting Tool Institute. It gives compositions and characteristics of wrought stainless steels, practical considerations in machining, information on tool designs and tool materials, and operating data for milling, drilling and reaming, and threading stainless steels. The final section of the book covers coolants and lubricants for use in machining these steels.

AMERICAN STANDARD SCREW THREAD GAGES AND GAGING (ASA B1.2-1951). 86 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York

ELECTROPLATING. By Samuel Field and A. Dudley Weill. 546 pages, 5 by 7 1/2 inches. Published by the Pitman Publishing Corporation, 2 W. 45th St., New York 19, N. Y. Price, $6.

This is the sixth edition of a well-known work on electroplating. It explains the latest methods, the principles underlying modern processes, and the equipment used. The analysis of solutions is included.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

For several years this space has been used to tell how Revere has collaborated with its customers, to mutual benefit. Now we want to talk about the way our customers can help us, again to mutual benefit. The subject is scrap. This is so important that a goodly number of Revere men, salesmen and others, have been assigned to urge customers to ship back to our mills the scrap generated from our mill products, such as sheet and strip, rod and bar, tube, plate, and so on. Probably few people realize it, but the copper and brass industry obtains about 30% of its metal requirements from scrap. In these days when copper is in such short supply, the importance of adequate supplies of scrap is greater than ever. We need scrap, our industry needs scrap, our country needs it promptly.

Scrap comes from many different sources, and in varying amounts. A company making screw-machine products may find that the finished parts weigh only about 50% as much as the original bar or rod. The turnings are valuable, and should be sold back to the mill. Firms who stamp parts out of strip have been materially helped in many cases by the Revere Technical Advisory Service, which delights in working out specifications as to dimensions in order to minimize the weight of trimmings; nevertheless, such manufacturing operations inevitably produce scrap. Revere needs it. Only by obtaining scrap can Revere, along with the other companies in the copper and brass business, do the utmost possible in filling orders. You see, scrap helps us help you.

In seeking copper and brass scrap we cannot appeal to the general public, nor, for that matter, to the small businesses, important though they are, which have only a few hundred pounds or so to dispose of at a time. Scrap in small amounts is taken by dealers, who perform a valuable service in collecting and sorting it, and making it available in large quantities to the mills. Revere, which ships large tonnages of mill products to important manufacturers, seeks from them in return the scrap that is generated, which runs into big figures of segregated or classified scrap, ready to be melted down and processed so that more tons of finished mill products can be provided.

So Revere, in your own interest, urges you to give some extra thought to the matter of scrap. The more you can help us in this respect, the more we can help you. When a Revere salesman calls and inquires about scrap, may we ask you to give him your cooperation? In fact, we would like to say that it would be in your own interest to give special thought at this time to all kinds of scrap. No matter what materials you buy, the chances are that some portions of them, whether trimmings or rejects, do not find their way into your finished products. Let's all see that everything that can be re-used or re-processed is turned back quickly into the appropriate channels and thus returned to our national sources of supply, for the protection of us all.

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Chase Celebrates Seventy-Fifth Anniversary

THIS year the Chase Brass & Copper Co., Inc., of Waterbury, Conn., is celebrating its seventy-fifth anniversary, having been founded in January, 1876, as the Waterbury Mfg. Co., Inc. The concern was launched with a capital of $25,000, which, in those days, was a considerable sum of money. The incorporators and original officers were: H. L. Hotchkiss, president; Augustus Sabin Chase, treasurer; and A. C. Northrop, secretary. Within a few years after the founding of the company, Augustus S. Chase became president; Henry Sabin Chase, his son, secretary and treasurer; and Richard J. Ashworth, superintendent.

Among the first products made by the firm were buttons and brass goods. When Augustus S. Chase died in 1896, he was succeeded as president by his eldest son, Henry Sabin Chase, and under the latter's management, the Waterbury Mfg. Co. grew to be one of the largest consumers of brass in the United States. The many brass products of the company at that time included oil lamps, brass bed parts, and harness ornaments in great variety. At one time, as recently as twenty-seven years ago, the company manufactured the astonishing total of 33,000 different articles.

By 1900, the growth of the business warranted the building of the Chase Rolling Mill. This was the first brass mill to bear the name of Chase, and it was the forerunner of several other and larger brass mills built for this company. The Chase Rolling Mill Co. was formed at this time to insure the Waterbury Mfg. Co. enough brass for its rapidly expanding business. For about forty-seven years, the old Chase Rolling Mill continued to produce brass in great quantities, but in November, 1947, it was consolidated with the Chase Metal Works plant in the Waterville section of Waterbury. Eventually, the Waterbury Mfg. Co., the Chase Rolling Mill Co., and the Chase Metal Works were merged in the Chase Companies, Inc.

Another milestone on the road to Chase expansion was the purchase, in 1909, of the Noera Mfg. Co. which manufactured all types of oilers and tire pumps. This business is still owned by the Chase Brass & Copper Co.

In 1927, the Chase Companies purchased the entire interests of the U. T. Hungerford Brass & Copper Co., and in 1929 the third brass mill to bear the name Chase was erected in Cleveland, Ohio. Another, and major, change occurred in 1929. This was the year that Chase became a subsidiary of Kennecott Copper Corporation, the world's largest producer of copper and the largest producer of domestic copper in the United States. In 1936, the company name was changed to Chase Brass & Copper Co., Inc.

During World War II, the United States Government called upon Chase executives and technicians to direct the building of a brass mill in Cleveland for the production of war material. At the end of the war, in August, 1946, Chase purchased the huge mill from the Government, and in order to distinguish it from the original Cleveland mill, officially designated it the Upson Road Plant, as it is known today. It is of interest to note that the Chase Brass & Copper Co.'s plant in Waterbury earned six Army-Navy "E" awards during the war.

* * *

National Scrap Drive Gains Momentum

Cooperating with the National Production Authority's recent request for a national scrap drive, the automotive industry has turned up in less than a month more than 33,000 tons of dormant iron and steel scrap, or enough to fill 775 freight cars. This amount represents only preliminary reports from members of the industry, according to the Scrap Committee of the Automobile Manufacturers Association. The current program, which is to be continuous, is over and above the industry's regular scrap procedures, in which thousands of tons of scrap are returned to mills weekly, and is concentrated mainly on worn-out or obsolete jigs, fixtures, tools, dies, machinery, and other equipment.

The General Motors Corporation, alone, by the combined efforts of its plants throughout the country, has collected and returned to the steel mills in ten weeks more than 19,000,000 pounds of non-production scrap metal.

The Scrap Committee of the AMA is meeting regularly to study the progress of the program and to develop additional means for finding dormant scrap.

* * *

Manpower Shortage in Tool and Die Industry

According to a recent report of the National Tool and Die Manufacturers Association, the backlog of tool, die, jig, and fixture orders for contract tool and die shops has reached the highest level since 1945. Industry output for 1951 is expected to be well above the 1950 total of $325,000,000.

Defense assignments continue to mount, and the average contract shop backlog is now triple that existing at the outbreak of Korean hostilities. This backlog is primarily due to the shortage of skilled labor, which continues to be the industry's "number one problem." For despite the fact that there has been an increase in the number of work hours per week, and a small increase in the size of the working force, neither of these factors has offset the sharply increased demand for the tools, dies, jigs, and fixtures needed in defense projects.

* * *

Decimal-Equivalent and Screw-Thread Data Disc

The Dayton Rogers Mfg. Co., producer of metal stampings and die-cut parts in small lots, is distributing a handy circular slide-rule that gives decimal equivalents and can also be used for rapidly determining diameter of tap, number of threads per inch, and diameter of tap drill for U. S. Standard screw threads, ASME Special and Standard machine screws, American Standard taper pipe threads, and ASME Standard screw threads.

These time-saver celluloid discs can be obtained free of charge by sending a request on a company letter-head to the Dayton Rogers Mfg. Co., 2824 Thirteenth Ave., S., Minneapolis 7, Minn.